AVIATION WEEK
SEPT. 15, 1952
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New "Thunderjet" 100% Equipped with Goodyear Wheels and Brakes

32 rockets of 5" size and two 450 gal. fuel tanks can be carried in addition to fixed armament.

FIRST operational swept-wing fighter-bomber of the Air Force, the new Republic F-84-F "Thunderjet" will start rolling off assembly lines this year — 100% equipped with specially designed wheels and brakes by Goodyear.

Design specifications for this high-speed, long-range jet included extremely rigorous landing gear requirements — high brake energy, restricted space, new tire and tube size, and above all, urgent speed in design and production of this special landing equipment.

Drawing on its 40 years' experience and 40 years of outstanding accomplishment in aviation, Goodyear met the design and delivery specifications with marked success. After extended Air Force tests, Goodyear landing equipment *alone* was able to qualify.

Result: Republic's assembly-line production of the F-84-F will be exclusively equipped with Goodyear wheels and brakes. And most important, one more key unit in America's climb to aerial supremacy will be ready on schedule.

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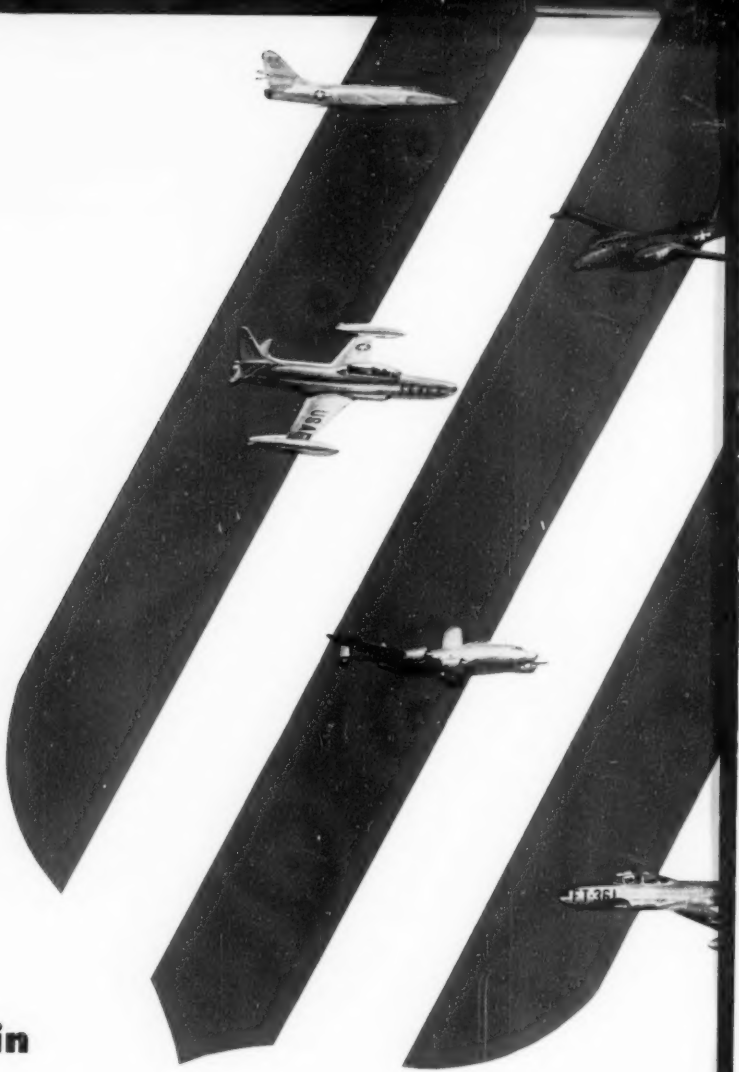

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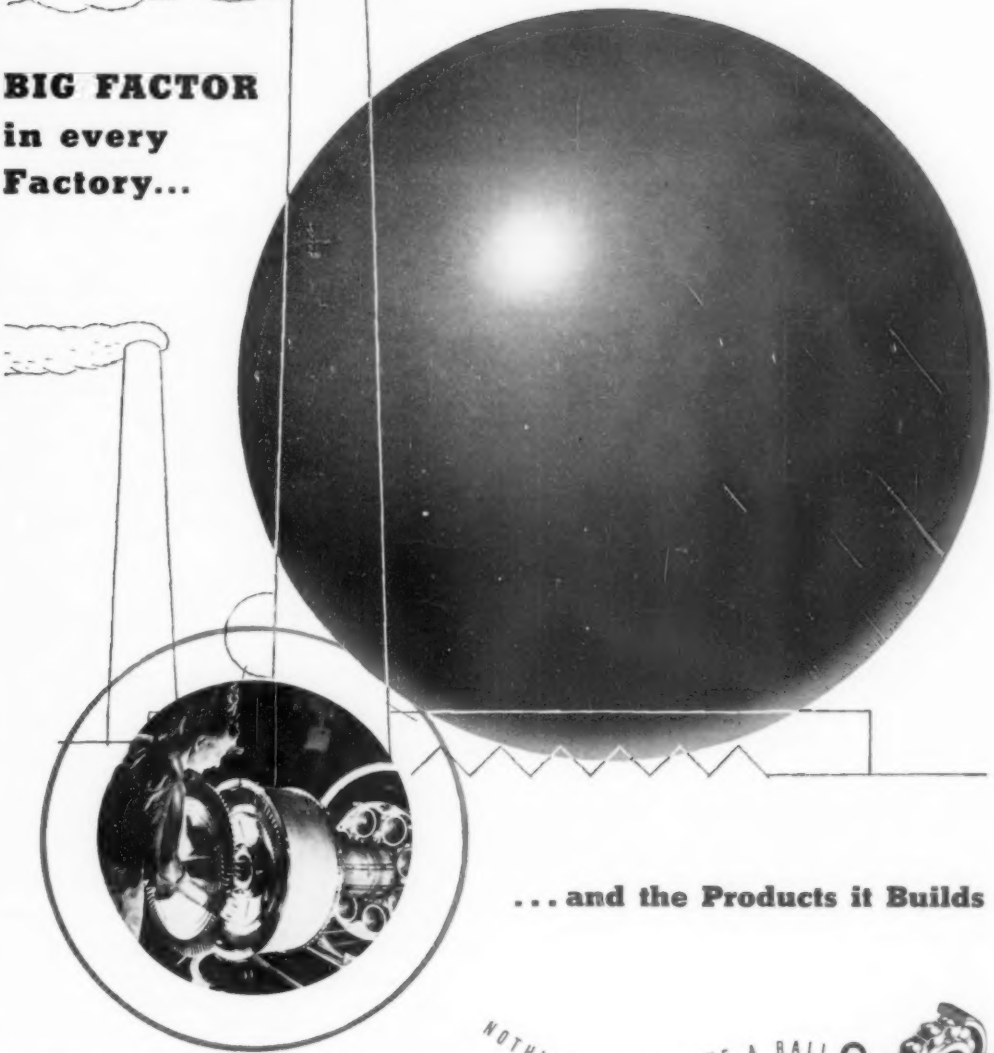

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Aviation Week

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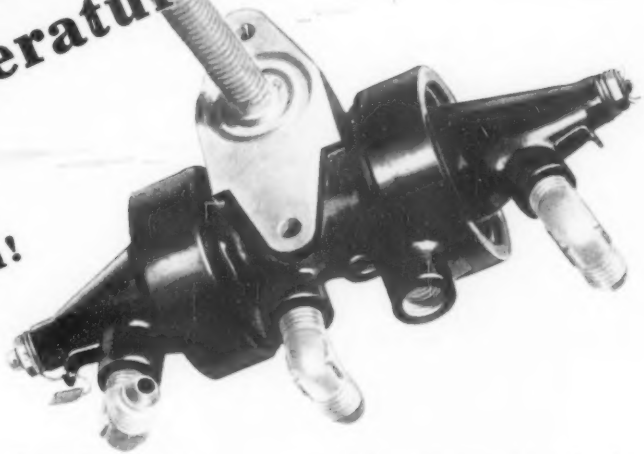
NEW pneumatic temperature control

developed by AiResearch!



Electronic equipment... radar... gun, rocket and camera compartments — these as well as aircraft cabins must be air conditioned in modern, high altitude, high speed planes.

To meet such specialized cooling problems AiResearch offers two major types of temperature controls: (1) pneumatic; (2) electronic. Each has specific advantages.

Newest development in pneumatic temperature control is the AiResearch unit shown above.

Outstanding features are:

1. **Extremely lightweight... under 2 pounds.**
2. **Small size... smaller than a man's fist.**
3. **Low first cost — low maintenance.**
4. **Requires no electric power... operates on bleed air.**
5. **Extremely rapid response.**

This advanced unit is now being used successfully for air temperature control on the Super Constellation. It is also being employed in auxiliary equipment on many types of turbo-jet and turbo-prop aircraft where the advantages of pneumatic power can be fully utilized.

Years of experience in the development and manufacture of pneumatic equipment for the aircraft industry are behind this newest AiResearch creation in air temperature control.

Would you like to work with us?
Qualified engineers, scientists and skilled craftsmen are needed now at AiResearch in both Los Angeles and Phoenix.

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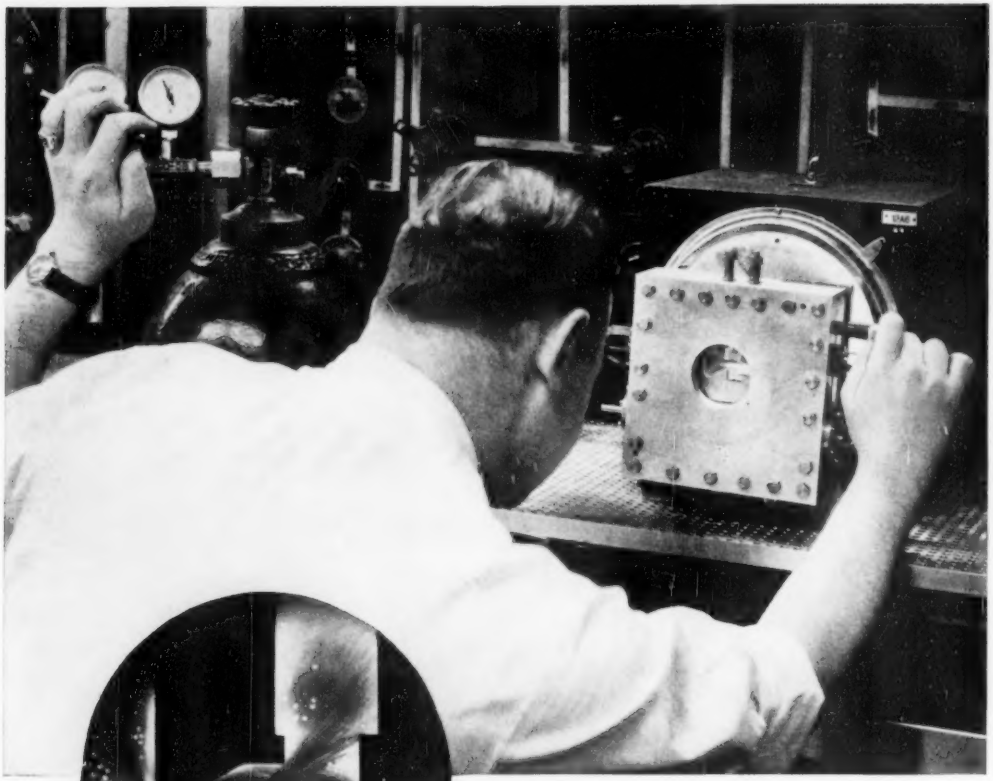


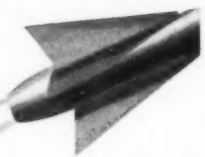
Fundamental Research for Tomorrow's Aircraft

This Sperry engineer is applying the fundamentals of hydraulics to determine oil flow characteristics at high pressure. Here he introduces nitrogen to the hydraulic fluid in a complex valve to make flow patterns visible for study.

This is an example of the fundamental engineering which precedes the design of high-power booster servos for use in automatic as well as manual flight.

Automatic controls for tomorrow's aircraft require extensive fundamental research. Not only in hydraulics, but in aerodynamics, electronics and gyros, Sperry engineers are establishing new sets of rules to work under.

For 40 years Sperry has been working continually on flight control problems. Currently, Gyropilot* flight controls are flying jet, propeller-driven, rotary-wing, lighter-than-air and pilotless aircraft.



With this background of leadership and experience and the constant exploration of fundamentals for new concepts of design, Sperry is able to anticipate and solve control problems for tomorrow's aircraft.

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NEWS DIGEST

Lockheed Workers Strike Six Plants

Burbank, Calif.—Last Monday morning Lockheed Aircraft Corp. workers threw picket lines around the company's six plants at Burbank, Van Nuys, North Hollywood, Beverly Hills, Bakersfield and Palmdale, halting production of F-94C Starfire interceptors, T-33 trainers, P2V Neptune patrol bombers and Constellation transports.

At the last minute, Lockheed boosted its offer to the union from two cents an hour to seven cents, with another two cents in fringe benefits. This was far short of the 10½-cent hike asked by the Union, which IAM says would average 20 cents an hour.

At week's end the strike threatened to spread to Douglas Aircraft Co. IAM's 25,000 members at Santa Monica and El Segundo served notice of an intended walkout at midnight Saturday. Demands were much the same as at Lockheed.

Domestic

USAF will expand pilot training to 10,000 men annually under a new program set up by Air Training Command. Present schedules call for 7,500 new pilots yearly.

The Manly Memorial Medal will be awarded two Curtiss-Wright Propeller division engineers, Joseph M. Mergen and Jack H. Kasley. Society of Automotive Engineers is bestowing the award in recognition of their paper, Characteristics of Propellers for Turboprop Airplanes.

Aircraft propellers and spare parts shipped during first half of 1952 were valued at $67.5 million, a 48% gain over similar period in 1951 and a 24% increase over last half of 1951.

Safest year of flying in its history has been completed by Strategic Air Command. Ending Aug. 31, SAC reduced overall accident rate to 20 accidents per 100,000 hr. flown from 35 per 100,000 hr. achieved the previous period. Ramey AFB, Puerto Rico, won formal possession of SAC's flying safety year trophy and "safest-base-of-the-year" title.

A new pulsejet copter is scheduled to be unveiled by American Helicopter Co., Inc., Manhattan Beach, Calif.

Ten gliding and soaring records were set at 11-day National Soaring Contest last month in Grand Prairie, Tex. Richard Johnson won the U. S. championship for the third consecutive year.

KAMAN UNVEILS NEW MODEL—First photo to be released of new Kaman HOK-1 Navy copter shows a model of the twin-boom craft. In production, the HOK-1 is powered by a 525-hp. Continental engine turning intermeshing rotors.

Dr. C. C. Furnas, director, Cornell Aeronautical Laboratory, Inc., Buffalo, has been named chairman of the Committee on Guided Missiles, of the Research and Development Board, Department of Defense, succeeding Dr. Clark B. Millikan, director, Guggenheim Aeronautical Laboratory, California Institute of Technology.

Big new turboprop engine, expected to "dwarf any aircraft engine yet made public" is in advanced stages of development by Wright Aeronautical division, Wood-Ridge, N. J. Powerplant incorporates best features of previous Wright projects. Firm also announced a series of turboelectric props ranging up to 20,000-hp. class.

Turboprop Super Connies can be delivered beginning Jan. 1, 1955, if orders are received now, says a Lockheed official.

Financial

McDonnell Aircraft Corp., St. Louis, Mo., notes earnings after taxes of $3,064,243 for the fiscal year ending June 30 on sales of $81,743,306.

Northwest Airlines had net profit after provision for income taxes of $277,766 during July on operating revenues of $5,288,852.

National Airlines reports net earnings of $2,048,300 for the fiscal year ended June 30. Operating revenues for the year totaled $28,264,465.

Flying Tiger Line achieved revenues of $21,837,496, for the fiscal year ended June 30, a 40% gain over the previous fiscal year. Net income after taxes and dividends reached $1,529,000.

International

International Airlines' revenue flying this year will climb 250% over mark of five years ago, predicts Sir William P. Hildred, Director General of the International Air Transport Assn. He says that 45 million passengers will be carried by the end of December, 1952, and guesses that airline revenues will total "something less than $2 billion."

Canadian government spent $2,237,000 during July 16-Aug. 15 on aircraft parts, equipment and overhaul. Canadian General Electric Co., Toronto, was awarded the largest single contract, $1.5 million, for engine overhauls.

Servicos Aeros Cruzerio Do Sul Ltd., Brazil, has ordered four Convair 340s for service in 1954, bringing Convair's 340 sales to 172. The Brazilian carrier ordered the Convairs after evaluating other U. S. and also British types.

No. 3 engine of Scandinavian Airlines System DC-6 was wrenched from its dynafocal mounts and dropped into South Atlantic Ocean two hours after plane left Rio de Janeiro bound for Montevideo. Pilot turned back and landed safely at Santa Cruz, north of Rio. Engine was a Pratt & Whitney R2800 turning a Curtiss propeller. There was no prior warning of malfunction and no definite cause has been given for the incident, which occurred at an altitude of 15,700 ft. Aug. 14.

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AVIATION CALENDAR

Sept. 15-19—International Air Transport Assn., eighth annual general meeting, Geneva, Switzerland.

Sept. 23-25—Air Transport Assn. annual engineering and maintenance conference, Saxony Hotel, Miami Beach, Fla. (closed meeting this year).

Sept. 25-26—Radio Technical Commission for Aeronautics fall assembly meeting, Hotel Statler, Buffalo, N. Y.

Sept. 26-28—Aero Medical Assn., interim meeting, Paris, France.

Sept. 27—Nantucket Air Tour dinner and hangar dance (Ancient Order of the Deep), Nantucket Is., Mass.

Sept. 29-Oct. 1—National Electronics Conference, Sherman Hotel, Chicago.

Sept. 30-Oct. 2—Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Toledo.

Oct. 1-4—Society of Automotive Engineers national aeronautics meeting, aircraft engineering display and aircraft production forum, Hotel Statler, Los Angeles.

Oct. 7-8—Aircraft Electrical Society ninth annual display meeting, Pan Pacific Auditorium, Los Angeles.

Oct. 9-10—Airport management operations conference, Oklahoma University.

Oct. 11-18—Fourth annual All-Texas Air Tour; information available from Texas Aeronautics Commission, Austin.

Oct. 19-24—American Welding Society national fall meeting, Bellevue-Stratford Hotel, Philadelphia.

Oct. 25-Nov. 2—International aviation and travel exposition, Navy Pier, Chicago.

Oct. 28-30—Transport Aircraft Hydraulics System Conference, sponsored by Vickers, Inc., Hotel Park Sheraton, Detroit.

Oct. 28-30—AIEE Air Transport Committee annual meeting, Commodore Perry Hotel, Toledo.

Oct. 29-31—AIEE conference on machine tools, Ten Eyck Hotel, Albany, N. Y.

Nov. 6-7—National fuels and lubricants meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.

Nov. 11-12—Piper distributors' annual meeting, Lock Haven, Pa.

Nov. 17-20—National Aviation Trades Assn. annual convention, Hollywood-Roosevelt Hotel, Los Angeles.

Dec. 2—Symposium on light-metal heavy forgings and extrusions for aircraft, SAE, ASME, IAS and AIME.

Dec. 10-12—Joint AIEE-IRE-ACM conference on electronic computers, Park Sheraton Hotel, New York.

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Washington Roundup

Emergency Over?

The U. S. military buildup is being turned over increasingly to the Defense Department. The "emergency" organization is grinding to a halt:

• New director of the Office of Defense Mobilization, Henry H. Fowler, has signed up in that post until the end of the year. He will continue as head of Defense Production Administration, too. Fowler formerly headed National Production Authority.

• But the merged ODM-DPA will be little more than a nucleus planning setup when Fowler leaves.

• By the beginning of the year, operation functions handled by National Production Authority will be turned over to Commerce Department.

• Except for steel, the Controlled Materials Plan is due to be abandoned during the first quarter of 1953.

▶ **New Key Man**—Key man in the defense production program until the new administration takes over Jan. 20 will be Hugh Dean, General Motors Corp. career man who retired as vice president in charge of manufacturing this spring.

As "trouble shooter" assistant to Defense Secretary Robert Lovett, Dean takes the position formerly held by Clay Bedford, now president of Chase Aircraft Co.

But Dean is expected to figure far more prominently in the defense picture than Bedford, because:

• Defense Department is starting to run its own show, with decreasing guidance from ODM.

• As of Sept. 8, Defense Secretary was armed with all-out legal authority to direct the procurement programs of the three services. With this authority, and spurred by sharp congressional criticism of lack of cooperation and coordination among the services, Lovett already has indicated he will exercise much stronger control. Dean will execute his program, abetting the efforts of Munitions Board chairman John Small, recently designated "czar" over production.

Balanced Forces?

This year's Battle of the Budget, now getting underway, will decide whether Air Force is to consolidate its position as the dominant service.

Current 1953 fiscal year was the first year the pie was cut markedly in USAF's favor: USAF, $20 billion; Navy, $13 billion; Army, $12 billion.

Army will offer resistance to a dominant USAF, but the die-hard opposition will come from Navy. Military, so far, are keeping in the background. The battle is being fought by the civilian secretaries. USAF Secretary Thomas Finletter and Navy Secretary Dan Kimball already have sounded calls to battle:

• **Finletter:** "This jump in Air Force strength—from 95 to 143-wing target—knocked out any idea that the so-called balanced-force concept meant a roughly equal three-way division of money and everything else among the services. . . .

"But I believe that the issue of the kind of force we are going to create is teetering in the balance, and it may very well be the leadership which is forthcoming from the Air Force which will decide it in the right way."

• **Kimball:** "Support our country's defense efforts. This means balanced forces on land, on the sea, and in the air.

"Resist those who would have us develop one arm of service and neglect the others. This concept, in my opinion, is national folly. It is like supplying a fire department with hoses, but no engines."

For the year following the Korean outbreak, 1951 fiscal year, Army was appropriated the biggest money slice: Army, $19 billion; USAF, $15 billion; Navy, $12 billion.

But last year, 1952 fiscal, USAF edged ahead by a conservative margin: USAF, $22 billion; Army $20 billion; Navy $16 billion.

Budget Cutters

A group of little-known government career employes will do hatchet work on the multi-billion-dollar 1954 fiscal year aircraft procurement budgets of the services.

They do not make final decisions. But their recommendations carry substantial weight.

Step by step, this is the course of coming-year aircraft estimates due to be submitted, along with all other defense estimates, to the White House by the Secretary of Defense Nov. 1:

• Ten staffers of the Bureau of the Budget and office of Secretary of Defense are now hearing justifications of service requests.

• After they make decisions on cuts, in a few weeks, the services will have an opportunity for rebuttal.

• After this, the staff, headed by Lyle Garlock, representing the office of the Defense Secretary, and Ellis Veatch, representing Budget Bureau, will submit a three-column aircraft procurement budget to Secretary Lovett: (1) Amount requested by the service; (2) Recommended; (3) Reason if cut is recommended. It is due Oct. 23.

• Services will have approximately a week in which to defend their estimates against staff actions. Presentations of Lovett are oral, and final decisions are generally made by him on-the-spot.

▶ **Who They Are**—Background of key staffers handling aircraft procurement funds:

• **Lyle S. Garlock**, deputy comptroller for budget, Defense Department, has been in government service since his graduation from the University of Minnesota in 1931, serving with the Department of Labor, War Manpower Commission, Navy.

• **Ellis H. Veatch**, chief of the National Security Branch, Budget Bureau, has been in government service since his graduation from Miami University in 1934, serving with Works Progress Administration and Office of Civilian Defense, and entering Budget ten years ago.

• **Irving Roth**, head of the aircraft unit under Garlock, has been in government since his graduation from Southeastern University in 1941, serving with the Corps of Engineers and War Manpower Commission.

• **Howard Henn**, head of the Air Force unit under Veatch. Since graduation from the University of Wisconsin in 1936, he has served with the Security Exchange Commission and Army before going to Budget in 1946.

• **Wells H. Thomsen**, head of the Navy unit under Veatch. After receiving graduate degrees in business and public administration from Harvard University, he worked in production scheduling for General Electric Co. before coming to Budget Bureau in 1943.

• **Charles Per-Lee**, after receiving a business administration degree in 1937, he served with Chase National Bank for three years and with the Army (on fiscal matters) for four years before going to Budget Bureau in 1946.

—Katherine Johnsen

Remington Rand Methods News

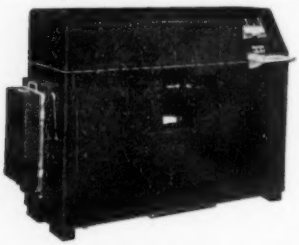
How many ways can a job order get itself "lost" in your plant?

When your assembly floor is running short on a manufactured part, how long does it take to check its status? Do your expediters have to thumb through cards and books? Or track it down by the operations sheet?

It's easy to stop this hide-and-seek game . . . and get business-like control over shop orders. Just file a copy of each order in a *Visible-Tip* folder. The movable signal is set for date of first follow-up (such as receipt of materials). Signal is progressively re-set for follow-up at each work center or other check point.

Just a glance at folders indicates which jobs need expediting. Status of any job is shown instantly by signal position. All folders remain in sequence by part or release number for fast filing and reference. Note four more advantages: 1) No posting is needed to show job progression. 2) Job folder gives more than skeleton information; can be a complete in-process file (even for gathering job cost data). 3) Signaling can be tailored to your scheduling needs. 4) Folder can be re-used. For details on this method, see booklet **LBV-567.**

If your parts production is standardized, Kardex visible records in part-number sequence may give you same follow-up efficiency. See manual **X-1268.**



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PRODUCTION PICTURE OF AN ASSEMBLY. This method shows you where you stand on each assembly and its components – how many days ahead or behind schedule, and which components are holding up production. Just a glance gives you the complete picture of *actual* against required production and where the expediting is needed. For more information on this visible method, see fully-detailed production control manual X-1268.

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WHO'S WHERE

In the Front Office

Ramsay D. Potts, Jr., is new president of the Independent Military Air Transport Assn. Potts formerly was special assistant to Stuart Symington while the latter was administrator of RFC and chairman of NSRB. **Howard Korth**, interim president of IMATA, has been named chairman of the board.

Clifford W. Sponsel has been named vice president in charge of a new aircraft division formed by American Car & Foundry Co., which will have headquarters at St. Charles, Mo. The new division will handle production of B-47 fuselage sections.

J. D. Pearson has been appointed chief executive of Rolls-Royce Ltd.'s Aero division, Derby. Pearson joined R-R in 1933, became a director and general manager of the Aero division in 1950. **A. F. Kelley**, formerly assistant general manager of Aero division has been made general manager.

C. P. Boggs is new vice president in charge of manufacturing for Brush Development Co., Cleveland, Ohio, maker of industrial and research instruments, ultrasonic equipment and other devices. He previously was with Sylvania Electric Co.

Changes

Arthur E. Smith has been named assistant to Pratt & Whitney Aircraft division's engineering manager, a new post under a reorganization of the engine-maker's engineering department. Succeeding Smith as chief engineer is **Perry W. Pratt. B. A. Schmickrath** has been promoted to assistant chief engineer in charge of production engines and **Guy E. Beardsley, Jr.**, becomes development engineer in charge of P&W's atomic aircraft engine project. **W. L. Gorton, Jr.**, is development engineer for the ramjet project and **Roger C. Young** has been promoted to head the centrifugal jet engine project. **Ross H. Begg** is assigned as development engineer in charge of the J57 under Schmickrath and **Gordon Glover** heads up all piston engine projects. **George F. Armbruster** has been made project engineer on the R4360.

John H. Russell has been appointed managing director of all Transocean Air Lines' Middle East activities.

Sydney W. Taylor has been named assistant general manager of the Kaiser-Frazer Aircraft division at Willow Run, Mich.

Dr. Carl R. Freberg has been designated assistant director of the Borg-Warner research laboratory, Bellwood, Ill.

Billy B. Curl has been named to the technical staff of Russell Reinforced Plastics Corp., Lindenhurst, N. Y.

Jack Anderson has joined Marquardt Aircraft Co., Van Nuys, Calif., as manager of public relations and advertising.

Richard J. Forhan has been designated regional director of Pan American World Airways' Central European Region with headquarters in Frankfurt, Germany.

INDUSTRY OBSERVER

This week's column was cabled from London by AVIATION WEEK *executive editor Robert B. Hotz, who attended the annual SBAC show at Farnborough.*

► Bristol will get strong competition from Rolls-Royce and Armstrong Siddeley in the high-powered axial-flow jet field. Both the Rolls R.A.14 and Armstrong Siddeley Sapphire 4 are in the 10,000-lb. thrust class and well along in development.

► Boulton Paul expects to be flying its second P.120 delta wing research plane in a few weeks. The first P.120 crashed just before the SBAC show, shedding one elevator after first-degree flutter in the horizontal tailplane. Test pilot Ben Gunn bailed out at 3,000 ft., suffered minor injuries when he landed in a tree just ahead of his ejection seat. Flutter occurred at relatively low speed and altitude.

► Time for meeting the deadline for British European Airways' helicopter specification is running out with most firms still undecided about their proposals. Westland, Fairey, Percival and Bristol are expected to submit designs, with Blackburn and General as another possible contender. BEA expects the competition to develop a helicopter that will be a radical departure from current practice and a major technical advance, similar to the advent of the Comet in the fixed-wing transport picture.

► Napier and Son Ltd. have developed a new axial-flow turboprop rated at 3,000 eshp. called the Eland. This turboprop features an extremely low specific weight—about one-half lb. engine weight per hp. delivered. It has a maximum diameter of 36 in., weighs 1,575 lb. and is 104½ in. long. Eland has an axial compressor and turbine, six combustion chambers. Single shaft drives a four-bladed constant-speed propeller. It may be used in advanced development of the Viscount series transports.

► The British also are concerned with the alarming trend toward heavier, more complex and expensive aircraft. Proposals have been submitted for a stripped-down jet fighter grossing only 5,000 lb. Rolls-Royce also has proposed a 3,000-lb. thrust jet engine that would weigh only 550 lb.

► There is a trend toward heavier armament on British fighters and bombers. The Hawker Hunter and Supermarine's Swift and Type 508 are all armed with 30-mm. cannon. A new nose turret mounting twin 20-mm. cannon has been added to the Avro Shackleton Mark 2.

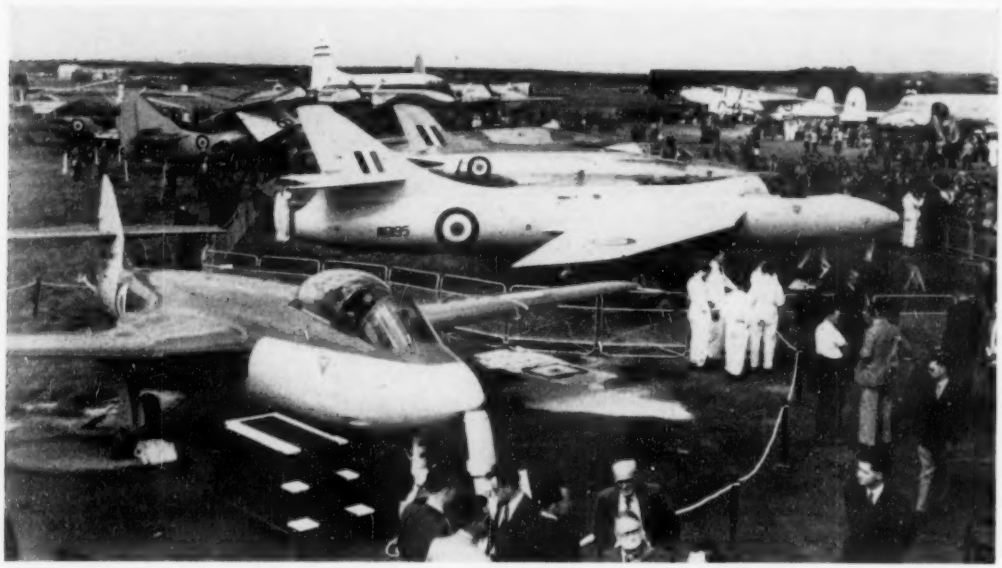
► The Short S.A.4 four-jet bomber will be used as a flying testbed for the Bristol Olympus turbojet. The Olympus will be installed in the lower half of each twin jet nacelle with Rolls-Royce Avon in the top spot.

► Takeoff of the de Havilland Comet using two 4,300-lb.-thrust Sprite rockets left no visible smoke trails although the noise level rose sharply when the Sprites were cut in. Elimination of permanganate as catalyst in rocket fuel is credited with banishing smoke.

► Bristol will redesign the Britannia turboprop nacelles in the production version. Proteus jet tailpipes now turn up and exhaust through top nacelle, thus dissipating thrust in the wrong direction. In new nacelles, tailpipes will run straight back exhausting over trailing edge of wing. Some attempt also will be made to slim fat nacelles. Bristol's reverse flow-type gas turbine requires larger diameter than necessary with conventional air flow straight through the engine.

► Scottish Aviation of Prestwick is developing a 16-passenger twin-engine version of its Pioneer, short field transport. The twin Pioneer will be powered by two Alvis Leonides engines and is designed to operate from 400-ft. airstrips with a maximum fuel and passenger load permitting a 500-mi. range plus requirements to reach an alternate 100-mi. distance. Scottish Aviation feels that the single and twin Pioneers will extend air transport to many areas where it is impossible to build conventional airport runways.

AVIATION WEEK VOL. 57, NO. 12
SEPTEMBER 15, 1952



PUBLIC DISPLAY shows potential customers what Britain has to offer NATO air forces. Second talking point in export market is . . .

Britain Bids for World Jet Plane Business

- **With SBAC display as showcase, U. K. industry hopes to sell $250 million worth of fighters to NATO.**
- **And it showed airlines turbine transports that are not merely prototypes, but now are in production.**

By Robert B. Hotz
(By Cable to Aviation Week)

Farnborough—A strong effort by the British aircraft industry to capture a much larger share of the world export market lay behind the glittering showcase of transonic military aircraft and commercial jet transports displayed here last week at the 13th annual show of the Society of British Aircraft Constructors.

In the military field, the British are pressing hard to sell the equivalent of $250 million worth of transonic jet fighters to the air forces of the North Atlantic Treaty Organization under the U.S.-financed off-shore procurement program. Half may be in dollars and half in European currencies.

In the commercial field, the British now see the payoff in prospect for their long postwar period of experimentation and development on jet transports. They now are able to offer production versions of the jet-powered Comet and the turboprop Viscount, modified to meet airline requirements rather than bureaucratic specifications. And they have sufficient preliminary airline operating experience to reinforce their sales pitch.

▶**Forty to One**—Behind both sales efforts lies a growing realization in top-level British government circles that aircraft offers a more lucrative export field to attract scarce dollars than some other industries whose export products have been given a higher priority in the past. For example, the British press now hammers the point that every pound of aircraft weight exported brings back £10 sterling, while each pound of automobile weight returns only £1 sterling.

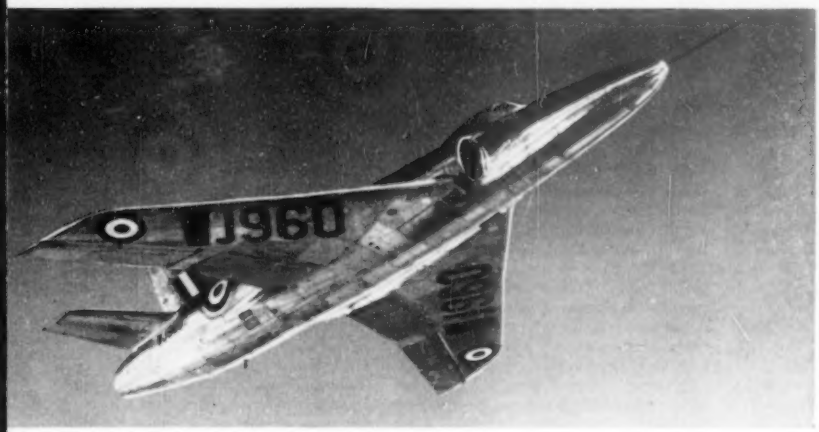
The biggest hurdle for large-scale sales of both military and commercial jet aircraft is the production problem. Despite the application of super-priority ratings to exportable jet production, the British aircraft industry still is a long way from rolling toward production rates required to meet the ambitious goals of the export program plus the domestic defense needs.

▶**Bird in the Hand**—There is increasing awareness in British industry, now that it is passing from development to production on its key jets, that unless delivery date requirements of foreign airlines and air forces can reasonably be met the export program will fall short of goals and not reap the rich returns expected on the costly postwar jet development program.

Foreign observers agreed that the British transonic military aircraft prototypes displayed at the SBAC show could hold their own with anything in a similar stage of development this side of the Iron Curtain. But daily unauthorized flights over Farnborough of F-86 Sabres underlined the fact that the British are not yet in production and delivering models of a single modern military fighter plane.

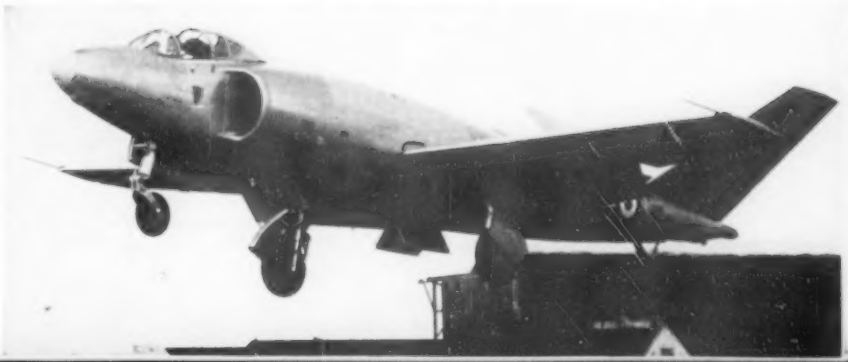
The Sabres, built by North Amer-

PRODUCTION OF TURBINE TRANSPORTS such as turboprop Viscount. Yet production also is a weak point; it's not great enough.



SUPERMARINE SWIFT is one horn of a British dilemma. It has a super-priority production rating and is the fighter Britain wants to sell abroad. But foreign buyers prefer the Hawker Hunter (p. 15), production of which is not great enough for Britain to share with others. Likewise, the . . .

SUPERMARINE TYPE 508 naval fighter impressed foreign observers. But it is not on the super-priority list, and likely has to be redesigned with swept wings to take full advantage of its two Avon jet engines.



ican Aviation, Inc. and Canadair and flown by USAF and RCAF pilots, are the only first-line aircraft now available for the air defense of Western Europe.

▶ **Wares in Air**—The flying display gave observers an excellent opportunity to see the performance of six super-priority military aircraft: Hawker Hunter and Supermarine Swift interceptors; Gloster Javelin night fighter; English Electric Canberra and Vickers Valiant bombers; and Fairey Gannet anti-submarine plane.

Most observers agreed the Hunter is clearly superior to the Swift in the day fighter class, and this is an early snag in the off-shore procurement program. There is a heavy foreign preference for the Hunter and a reluctance to accept the Swift. Since Britain has only limited production facilities for the Hunter and naturally has given the RAF first priority, it is anxious to sell Swifts abroad.

Both the Hunter and the Swift flown at the show were preproduction prototypes, the second of each type to be built. During the year since the Hunter first flew, less than a half dozen have been built and such important modifications as armament have not yet been fully incorporated.

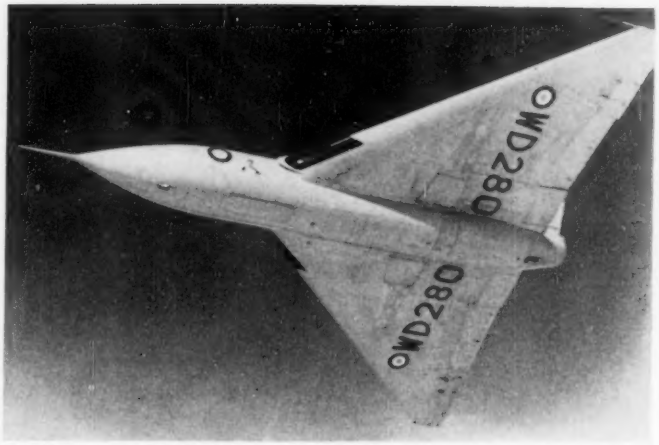
• **The deltas.** The second prototype of the Gloster Javelin flown at Farnborough was still under speed restrictions that kept it from doing more than 450 mph. The impressive feature of its flying was the extreme maneuverability of the lightly loaded delta wing.

Similarly, Roland Falk, pilot of the Avro 698 delta bomber surprised technical observers with the ease and confidence with which he maneuvered the big white delta (about twice the size of the Javelin) after only a few hours' flight time.

• **The Canberra.** It was obvious that the straight-wing Canberra, flying with a variety of new and more powerful engines, is just about at the speed limitations of its airframe design. It is expected that Canberra production will be curtailed drastically in favor of the sweptwing Vickers Valiant and Avro Delta 698, both powered by four late-model 7,500-lb.-thrust Avon jets.

The various power combinations displayed in the Canberras included a pair of uprated 8,300-lb.-thrust Sapphires; a pair of Olympus split-compressor jets that in the Canberra installation were about 1,000 lb. below the normal 9,750-lb.-thrust rating; and two 7,500-lb.-thrust Avons equipped with afterburners that gave each engine about 10,000 lb. thrust.

The Avon-equipped Canberra roared into the air from a standing start within 40 sec. of engine starting time, and continued in a 70-deg. climb with both afterburners roaring all-out. In high-speed passes across the field, both the Canberra using afterburners and the one used as the Olympus flying test bed were going fast enough to produce local shock conditions at various points of the aircraft.



AVRO 707A, flying scale model of 698 bomber. This bomber and the one below, the . . .

VICKERS VALIANT, most likely will be given production preference over the Canberra.

• **Navy planes.** Although not on the super-priority list, the Supermarine Type 508 twin-jet naval carrier fighter prototype impressed foreign observers with the handling of power from twin-Avon installations; excellent flight characteristics at very low speed ranges; and high-speed maneuverability.

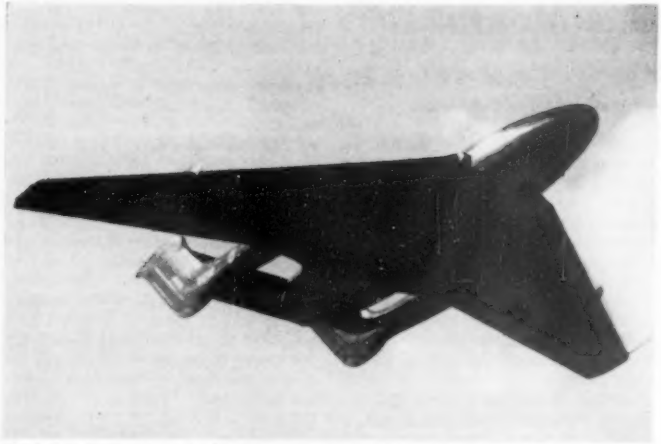
However, the Type 508 obviously must be redesigned with swept wings to take full advantage of the power from the two Avons. Consequently, it is a long way from even beginning production. The Hawker Sea Hawk, powered by a 5,000-lb.-thrust Nene and which first flew in 1948, is now going into squadron service as the latest Royal Navy carrier-based fighter.

The Fairey Gannet appeared in its production version with two small vertical fins added to its empennage for additional directional stability. The Gannet demonstrated maneuverability and performance with one of its two Mamba power sections cut out, and one of two contra-rotating propellers feathered. A propeller brake held the feathered prop rigid in contrast to slow windmilling of turboprop propellers without a feathering brake.

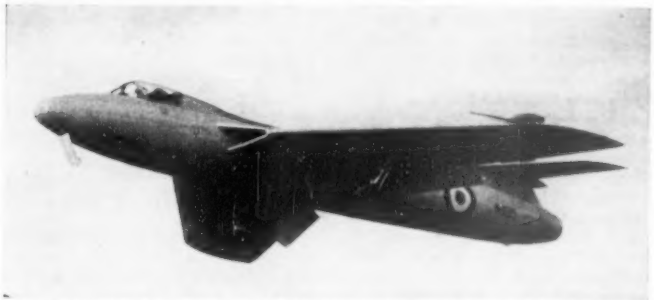
The Gannet combines all of the anti-submarine hunter-killer operations in a single aircraft with a three-man crew, while the U.S. Navy now requires two specialized aircraft working as a team that cannot function if either aircrafts aborts.

▶ **Commercial Show-Case**—On the transport side, the British made excellent use of paint to advertise the commercial success of their wares. Wherever possible, commercial transports were displayed brightly painted with the livery of an airline that had purchased them.

First de Havilland Comet 1a carried markings of Canadian Pacific Airlines and was staffed with CPA stewardesses, and technicians who were pleased to remind American visitors that this was the first British airliner to be exported to North America since the war. A de Havilland Heron carried markings



DH 110, first prototype of which came apart over field as Pilot Derry vied with . . .



HAWKER HUNTER, piloted by Neville Duke, in supersonic dives and low-level passes.

of a Japanese airline. A DH Dove displayed had a U.S. flag; it is scheduled for delivery to a Cleveland construction firm as an executive transport.

The British are extremely pleased with the success of Dove sales in the U.S., with 60 now on order and 80% of the DH Chester plant production now earmarked for U.S. customers.

A production model Viscount carried the red British European Airways livery and has been renamed the Discovery. The Bristol Britannia prototype, although far from production, was resplendent in British Overseas Airways Corp. markings. The British are highly optimistic of the Britannia's future in the airline transport market, and Sir Miles Thomas, BOAC chairman, told AVIATION WEEK he regards the Britannia as a better airline plane than the Comet from the standpoint of profitable operations.

The Saunders-Roe Princess, giant flying boat, made a brief flying appearance at the show, impressing observers with the graceful lines that concealed its huge hulk and swallowed the ten Proteus turboprops in the wings. From the rear the 10 tailpipes made the Princess wing look like a pipe organ.

The second Princess airframe has been completed but is being mothballed because no Proteus Mark 2 turboprops are available.

In the helicopter field it is evident that Britain's hopes still rest in the future although there is ample evidence of a quickening of interest by manufacturers. A wide variety of future experimental projects is on the drawing boards. But the Bristol twin-engine 173, 13-passenger job, is the only commercial possibility on the immediate horizon.

► **Prelude to Tragedy**—All during the week of the show the high-speed flight displays were featured by keen rivalry between Neville Duke flying a pale green Hawker-Hunter and John Derry in a black de Havilland DH 110 night fighter.

Both pilots vied in producing shock wave bangs by diving on Farnborough Field from 44,000 ft.

As the pilots pulled out of their dives, in which they passed Mach 1 and enveloped their aircraft in shock waves, the waves continued earthward, hitting the ground with a mighty boom that sounded like a double beat on an enormous bass drum. They followed this routine with a screeching pass across the field just above the grass, during which local shock conditions at various points of the air craft produced deep snarling noises sounding like the violent ripping of heavy canvas and the scream of heavy rubber tires skidding on concrete.

The Crash

This display of transonic flying with the latest British fighter prototypes introduced SBAC show spectators to the strange noises of sonic speed and the tragic spectacle of a sweptwing fighter disintegrating under the stress of supersonic flight at low altitude.

On Wednesday John Derry shredded the elevators of the variable incidence tail on the black DH 110 during transonic dives, but returned late the next day in a silver DH 110 —first of two prototypes—to continue the transonic displays.

Before 120,000 spectators on the second public day of the show the DH 110 came apart during a high-speed low-level run just after a supersonic dive. It killed 27 spectators, pilot Derry and his flight observer, Anthony Richards. Eyewitness reports said the twin-boom tail ripped off as the DH 110 turned toward the field. Wingtips, cockpit and engines broke off as the plane continued across the airdrome. The flaming jet engines hurtled into a crowd of spectators on a nearby hillside, causing most of the casualties.

As soon as the bodies were removed and the excitement subsided, Neville Duke continued the show in the Hunter. Next day, in the show finale, Duke surpassed all previous performances with grass-cutting speed runs well over 700 mph. and sending supersonic booms down onto the field through a heavy overcast and rain.

Derry was England's leading supersonic pilot. He was the first British pilot to push a British plane to Mach 1 (in the DH tailless 108 research plane) and had made more than 100 supersonic flights in DH 110 prototypes. He died four years to the day from his first supersonic flight in the DH 108.

SBAC issued a bulletin stating "There is no prima facie reason for believing that the accident was associated with the supersonic flight that preceded it." However, British test pilots discussing sonic flight before the accident agreed that it is possible to "bust up" any aircraft by sonic flight at extremely low altitudes. The fact that a triple sonic boom was heard after Derry's last dive, instead of the normal double boom, may indicate that he continued sonic speed below the usual pull-out point.—**RBH**

800 Military Planes a Month

USAF, Navy answer critics by showing production has more than quadrupled since start of Korean war.

By Alexander McSurely

Top defense officials have disclosed that U.S. military production has now climbed to well over 800 planes a month—approximately four times the monthly figure at the beginning of the Korean conflict.

Here are recent statements on U.S. aircraft production, which together present a well-rounded picture:

• "Total (military) aircraft acceptances in July were substantially above 800 units"—Dr. John Steelman, retiring Defense Mobilizer.

• Last month (July) the Navy accepted delivery on 250 aircraft. This figure may be compared with . . . 82 the month the war began in Korea"—Assistant Navy Secretary for Air John Floberg.

• "Total aircraft deliveries to the Air Force in July, 1952 . . . were more than five times what they were as the Korean war started"—Air Force Secretary Thomas K. Finletter.

• Army aviation took deliveries in July on approximately 130 aircraft, as compared with no aircraft in June, 1950. (Source: Army spokesman.)

▶ **Other Facts**—Comparison of the Steelman figure with the total military aircraft production figures for June, 1950—estimated at 215 planes by Aircraft Industries Assn., shows that July, 1952, production has virtually quadrupled that of June, 1950.

Here are some other significant statements by Secretary Finletter in his aircraft production press conference last week:

• **Total fighter production** for the Air Force, July, 1952, was about five times the amount of two years ago, and airframe weight of fighter production July, 1952, is six times that of July, 1950.

• **Bomber production** in July, 1952, was five times higher than in July, 1950, and in terms of weight, seven times.

• **Total production** (for Air Force) . . . will reach a peak by the end of this calendar year which will be nearly seven times the production of July, 1950.

▶ **Conclusions**—Analysis of the Finletter statements against the Steelman, Floberg, Army and AIA figures, indicates the following conclusions:

Subtract Navy deliveries of 250 planes from the 800-plus total and you get about 600 planes a month for Air Force deliveries.

Since both Navy and Air Force deliveries include some Army aircraft, an estimated 100 aircraft bought for the Army could be subtracted from the Air Force's 600 total, leaving about 500 planes a month of actual July, 1952, production for USAF.

Similar analysis of the 215-plane total production estimate for June, 1950, shows Air Force was getting 133 planes a month, after Navy's 82 are subtracted. Multiply the AF figure five times and you get a total of 665 planes, which is another indication of what Air Force July, 1952, delivery totaled. Presumably this would include Army plane procurement done by the Air Force.

Multiply the 133 figure seven times, and you get 931 planes, for the Air Force peak predicted "at the end of this calendar year" by Secretary Finletter.

▶ **Inventory Yardstick**—The Air Force Secretary pointed to recent statements that the Air Force has less planes in inventory today than at the start of the Korean war as misleading and a "bad measure." Planes assigned in wings and squadrons, to Tactical Air Command, Strategic Air Command, Air Defense Command, Troop Carrier Command and Military Air Transport Service, are the "planes that really count," he said. In this category, USAF planes increased 33% from July, 1950, to Mar. 31, 1952, he said.

The inventory cuts have been made in a second category of "other active planes"—including trainers, test planes, administrative, special mission and proficiency training planes—and in a third category of planes in storage, he explained. Trainers and other active planes have decreased about 14%, while planes in storage are down about 60%.

Since planes in storage are obsolescent World War II types, this means USAF is replacing its older types with modern planes as rapidly as they can be produced, "but still not fast enough," Finletter said. "There has been a substantial increase in the striking power of the Air Force in the items that count. The total inventory figure is misleading and should be debunked."

▶ **Can Hold 143 Wings**—Asked for a more definite statement as to comparative moderness of the USAF now and in June, 1950, Finletter said it was "substantially more modern now, but nowhere nearly modern enough."

Finletter expects the 143-wing Air Force can be maintained once it has been established at below the level of Air Force appropriation for 1953 (approximately $20 billion), but pointed out that increased personnel and operating costs will make it a continuing expensive operation.

Other significant Finletter statements:

• "The J65 engine and program is definitely not a failure. . . ."

• "In the air defense operation we are working toward an all-weather fleet by July 1, 1955. In the tactical field, towards improved fighter-bombers, light bombers and other tactical planes. In SAC we are fully aware of the fact that the Soviet Union has been building up its air defense, and we have been driving on constantly toward improvement of our fleet, not only in the medium bombers, but also in the heavy bombers—through addition of the B-52."

• "I am not yet satisfied with our quality program. We have not only to continue the emphasis, but to intensify this interest, even though it does slow down production."

• "American aircraft industry could produce a great many more planes, if we had all the appropriations we could ask for."

Ditching Rules Proposed by CAB

New airline regulations designed to give passengers a better chance for survival after water landings are being proposed by CAB's Bureau of Safety Regulation. Briefing of passengers on ditching procedures and equipment is one of the requirements.

In a hurry to get the new rules into effect, CAB has set Sept. 29 as the deadline for industry comment. The push was supplied by safety investigators' reports that in this year's two airliner ditchings, 88 persons drowned largely because of inadequate briefing and remote location of lifesaving equipment.

The cases involved were NWA-operated DC-4 crash off Sand Spit, in which 36 drowned and the PAA DC-4 water landing near San Juan, in which 52 passengers drowned.

Here are the four new CAB proposals for ditching and one for emergency evacuation in land accidents:

• **Rafts and lifevests.** Rafts and vests must be CAA-approved and must be located in approved locations, suitable for surprise ditchings. Past regulations were not only loosely interpreted and enforced, but were written on the theory that ditchings would be with warning. But in the last several years, almost all have been sudden. Equipment has often been hard to reach in coat-closets. The 20-man rafts weighing well over 100 lb. have been located

where the hostess could not lift them to the door or exit alone. Lifevests have been of varied design and sometimes inferior quality, CAB and CAA found.

• **Emergency lighting.** Doors and exits must be spot-lighted; the lights must be fed from independent battery source. Door handles must be plainly marked in luminous paint. Lights must be designed to go on automatically on crash impact. Night ditching by Northwest Airlines at Sandspit, B. C., last Jan. 19 was a lights-out situation; so no rafts and few lifevests were found.

• **Passenger briefing.** "In the case of extended overwater operations," airlines must brief passengers not only verbally but with actual demonstration of where to find the rafts and lifevests and how to put the vests on. Briefing must be held before the plane goes over water—before takeoff if necessary. Passenger panic, reported in some past ditchings, is attributed to insufficient briefing on what to do and where to go.

• **Land exit.** Ropes, chutes or other acceptable means of descent must be at all doors and exists (except those over the wing) more than six feet above ground when the plane is standing with its landing gear down.

Air Safety

Air Show Accidents Pose Design Problems

Spectacular structural collapse of two high-speed jets at Detroit and Farnborough, England, on successive weekends before the eyes of many thousands of air show spectators has given new vivid illustration to the serious problem confronting today's aircraft designers and specification writers—the slim margin between safe flight at high speed and structural disintegration.

(Details of the Farnborough crash are reported on p. 15 of this issue.)

At Detroit, 50,000 observers, including the writer, watched a Northrop F-89 two-place Scorpion interceptor as it crumbled and plunged to the ground from about 200 ft. First the right wing and tip tank snapped off at the wingroot, and the slender tail let go just behind the afterburners of the plane's twin Allison J35 engines. The two-man crew died when the fuselage with one wing still attached plunged crazily to the ground, crashed through a wooden building on the airfield and burned.

▶ **Second Plane Safe**—Pilot was Maj. Donald Adams, 31, Mt. Clemens, Mich., and radar observer was Capt. Edward Kelly, 34, New York. Adams was the 13th U. S. jet ace, with 100 Korean fighter missions and 6½ MiG kills. Five spectators were injured by falling debris.

A companion F-89 Scorpion, flying in formation with the crashed plane at virtually identical speed and under virtually identical conditions, came in for a safe landing at Selfridge AFB soon after.

In the absence of official military comment, veteran pilots and engineers who witnessed the crash came up with some partial explanations.

The airplane is a high-altitude interceptor, not primarily designed for fast operation at the on-the-deck altitude at which it was flying before starting its climb. Some such high-altitude specialized planes are customarily "redlined" at speeds well below 500 mph. until they get up to somewhere close to the 15,000-ft. level. The plane made a sharp pull-up as Adams kicked on its afterburners in preparation for a steep climb.

▶ **Some Theories**—Perhaps the sudden added power about the same time as the abrupt change in direction put enough stress on the fast-flying jet to collapse it. But if it collapsed one plane, why didn't the other one disintegrate similarly? Did Maj. John Recher, pilot of the other Scorpion, ease into the turn more smoothly or apply the additional power at a later interval? Was there a gust load factor that damaged Adams' plane and, if so, why wasn't Recher's plane, a few feet away, in the same gust?

Air Force and Navy experts have recognized more and more that the business of piloting a high-speed aircraft is an increasingly exacting one.

Disintegration of the Scorpion is one of a series of similar accidents in which different models of military jet planes, U. S., British and Russian, have pulled off their wings or otherwise collapsed under too-heavy loads imposed by gusts or sudden changes in direction or compressibility while they were flying at high speeds.

Probably Maj. Adams has witnessed some of these and was well acquainted with the problems involved as a result of his Korean jet missions, where several such incidents have been reported with MiGs.

▶ **Solutions Sought**—Solution of this problem may call for newer high strength materials, heavier gauges of existing materials or for redesign of parts to beef them up. The world's best aeronautical brains are looking for the best answers.

An Air Force spokesman at Detroit said the F-89s would be grounded pending a thorough check. Presumably he was referring to the planes at Detroit only, since Northrop Aircraft stated two days later they had no word of a general grounding. A spokesman for the company disclosed that it is starting additional low level tests of the plane "to explore every possibility."—A McS

Shakeup

- **Gross reshuffles top brass at Lockheed.**
- **Says aim is to expand policy committee.**

Burbank, Calif.—Lockheed Aircraft Corp. President Robert Gross last week announced a shuffling of assignments for his top brass.

Lockheed management, Gross felt, was creaking under strains imposed by recent changes in the size and nature of its business.

He made these major changes:

• **Courtlandt S. Gross** moved from vice president and general manager to executive vice president of the entire Lockheed Corporation, including the California and Georgia divisions as well as several subsidiaries.

• **Burt C. Monesmith,** promoted only last month to vice president-manufacturing, moved up another notch, becoming vice president and general manager of the California division.

• **Hall Hibbard,** engineering vice president and former chief engineer, moved up to the executive policy committee.

• **Clarence L. (Kelly) Johnson,** formerly chief research engineer, took over Hibbard's old post as chief engineer.

• **Carl B. Squier,** formerly vice president in charge of sales, was named assistant to the president. He remains a vice president but no new vice president for sales was named. Leonard K. Schwartz, former general sales manager, was named director of commercial sales.

▶ **Policy Makers**—The changes, Gross explained, are aimed at freeing top-level planners from worries over day-to-day operations. The reshuffle also makes room at the top for some of the company's fastest-rising executives. Primary concern, however, according to Gross, was setting up an expanded and less restricted policy committee for long-range planning.

Courtlandt Gross will be the link between the five-man policy committee and the operating organization. Changes affect only California Lockheed officials; Georgia was not altered.

Appointment of engineer Hibbard to the policy committee, the president said, is recognition of the importance of engineering in setting company policies and goals. Whether this forebodes any future change in the Lockheed success formula of finding a good basic design and stretching it to various requirements (Constellation to Super-Constellation, F-80 to T-33 to F-94) was not indicated.

▶ **Reasons**—Gross cited these reasons for the reorganization:

• Increasing volume of military and commercial business not only at the airframe plants but also at Lockheed Aircraft Service, Lockheed Aircraft Service International and Lockheed Air Terminal, all wholly owned subsidiaries, and Pacific Finance Corporation, in which Lockheed holds major interest.
• Increasing complexity of aircraft.
• Increasing competition.

"All these conditions point up the advantages of a clean-cut division between long-range, company-wide policy-making responsibilities and day-to-day operating functions," Gross said. He hopes the reorganization will "keep us in the market with salable planes 5, 10 and 15 years from now."

Other members of the policy committee which Hibbard joins are Robert Gross, Courtlandt Gross, C. A. Barker, Jr., as vice president and treasurer, and Cyril Chappellet, vice president of administration.

► **New Setup**—Here is the new setup under Monesmith: H. R. Campbell, formerly assistant treasurer and assistant secretary, takes over as director of administration, a new position; C. A. Fitzpatrick, formerly production manager, becomes manufacturing manager; Kelly Johnson is chief engineer; Schwartz, director of commercial sales; Harold Harrison, master scheduling manager; Joe Towle, director of flying operations.

• **Under Johnson** in engineering are: J. B. Wassall, assistant chief engineer (formerly chief project engineer); C. C. Coleman, chief aerodynamics engineer; Willis M. Hawkins, chief preliminary design engineer; W. R. Jones, chief staff engineer; M. C. Haddon, chief project engineer (formerly Constellation project engineer); J. F. McBrearty, chief structural engineer; R. L. Thoren, chief flight test engineer; and Walter W. West, engineering systems manager.

• **Under Campbell** in administration are: Robert B. Bias, military contracts administration manager; D. H. Cameron, director of industrial relations; I. P. Grunwald, director of financial operations (formerly assistant comptroller); and C. F. Nielsen, director of parts and services.

• **Under Fitzpatrick** in manufacturing are: Herbert Caldwell, production manager (formerly Factory B works manager); D. J. Gribbon, Factory B works manager (formerly Plant C works manager); W. A. Pulver, Factory C works manager (formerly assistant project engineer). Other top manufacturing assignments remain the same.

• **Under the new financial setup** Herschel Brown becomes chief accountant; Malcolm Williams cost accountant; and Frank Mathey assistant cost accountant.

Reporting directly to the policy committee under the streamlined plan will be:

Charles F. Thomas, military relations director, who will report to Hibbard.

John E. Canaday, director of public relations; H. M. Porter, industrial relations counsel; Roger B. Smith, chief legal counsel; and L. W. Wulfekuhler, corporate secretary, who will report to Chappellet.

D. E. Browne, comptroller, who will report to Barker as reporting official for L. V. Kerber, contract officer, and J. R. Janssen, assistant comptroller.

Standards Problems Trouble Designers

The problem of keeping U. S. aircraft quality high in face of a continuing Defense Dept. trend toward lower non-aeronautical standards in components specifications is giving industry engineers and designers a red tape headache.

But aside from that problem industry observers are inclined to view as generally beneficial to business Defense Secretary Robert A. Lovett's new directive calling for an integrated supply system for the several military departments.

If the new setup recognizes the difference between aircraft standards and others, the situation basically will be improved as the result of dealing with a single group of policies and procedures. Lovett said fundamental principles and basic objectives in supply management would be progressively attained in the new system through a series of implementing directives.

► **AIA Warning**—The new program, under guidance of Munitions Board Chairman John D. Small, is backed by a significant rider placed on the 1953 appropriations bill by Sen. Joseph O'Mahoney which says in essence: No officer or agency in the Department of Defense shall obligate any funds for procurement, production, warehousing or supply management except in accordance with regulations issued by the Secretary of Defense.

However, Aircraft Industries Assn., which has coordinated standardization of aircraft component parts, materials and process specifications between USAF and Navy Bureau of Aeronautics already has warned its member companies through AIA President DeWitt C. Ramsey, that:

"In the government's unification program there has been a gradual absorption of an aeronautical standards and specifications into the much broader military (MIL) series where the preponderance of interest is non-aeronautical. Time delays associated with coordination among numerous military departments and the resultant compromises that are necessary to reach agreement on such a broad coverage have altered the position of the aircraft industry, and have reduced the effectiveness of its efforts.

"Aeronautical quality is no longer the prime factor in MIL standards and specifications, and it is becoming increasingly necessary for industry to request deviations from the MIL series to meet its needs. It is thus apparent that we have substituted a system of deviations from general specifications for the previous system of separate departmental specifications.

"It is felt that the Air Force and the Navy Bureau of Aeronautics should reassess the role of the aircraft industry in the present military (MIL) standardization program to determine whether greater benefits might result from the same efforts concentrated on industrial standardization in the aeronautical field."

► **Examples**—One example of the quality problem presented was a brass component which required additional heat treating to bring it up to aircraft quality. When it was suggested that the standard item be heat treated for this purpose, Munitions Board pointed out that only one half of 1% of the total quantity would be used for aircraft, the remainder going for other military requirements, while it would increase cost of the item 20% to do the heat treating which is needed for aircraft use.

► **Not supply ministry**—One key figure in the new supply setup is expected to be Rear Adm. J. V. Fowler (Ret.), who has been director of the supply management agencies of the Munitions Board in charge of standardization and cataloging.

It is understood that the new defense supply setup will not be a separate "ministry of supply" like that in Great Britain, but will act as a monitoring organization over the existing supply organizations of the services to see that they follow Secretary of Defense directives for procurement and supply in a uniform manner.

Aeronautics Unit Elects

Harry K. Coffey, Portland, Ore., has been re-elected president of National Aeronautics Assn. Other officers named include: Rudy C. Mueller, Omaha, first vice-president; Mrs. Mary M. Brown, Akron, secretary; Edward C. Sweeney, treasurer; Miss Mae Simpson, assistant secretary-treasurer; William P. MacCracken, Jr., general counsel, and Dr. John F. Victory, executive committee chairman, all of Washington, D. C. Other executive committee members: Jacqueline Cochran, New York; Frederick C. Crawford, Cleveland; Roger Fleming, Indianapolis; William Lear, Grand Rapids; Ben Regan, Chicago.

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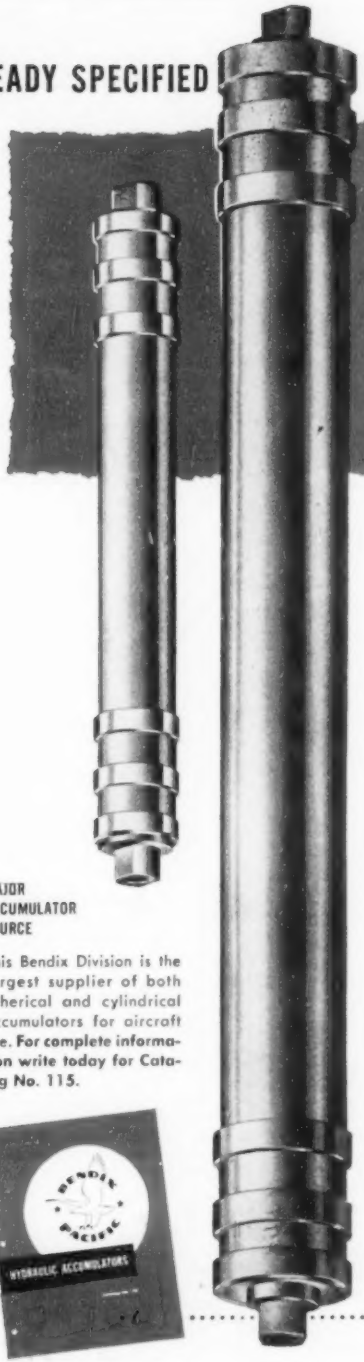

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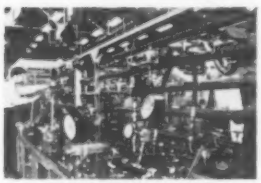

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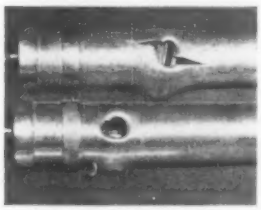

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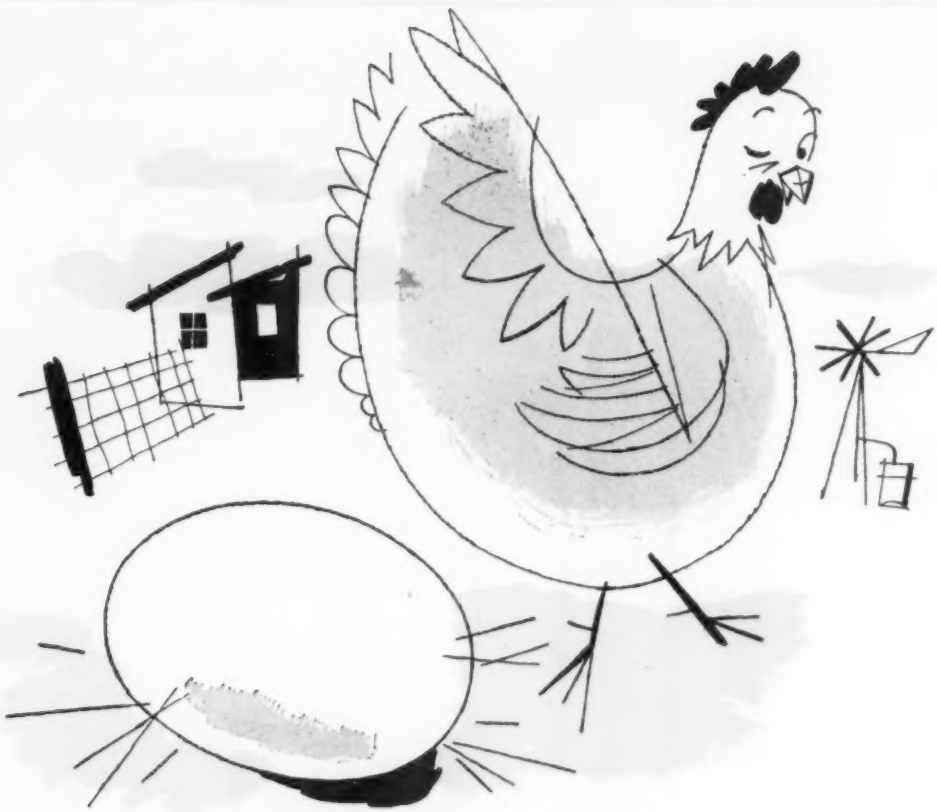

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DH 110: Study of a Fighter's Evolution

- **Basic design of new jet stems from Vampires.**
- **Latest in famed family boasts twin engines.**

The DH 110, twin-boom night fighter which is being demonstrated publicly for the first time at this year's SBAC display, is the culmination of ten years of jet fighter development by the de Havilland Enterprise, Britain's largest single aviation company.

The new craft has been ordered into quantity production for the Royal Air Force and about 300 are to be built.

Basic design layout of the DH 110 stems from the firm's famous Vampire series. That line began in May, 1942, with the start of design work on the DH 100—later to be named the Vampire—and has continued through a bag ful of models and variants.

▶**Behind the Design**—When early bench trials of the Whittle jet engines proved successful, the Ministry of Aircraft Production gave the Whittle patents and theories to industry, and commissioned designs from each of the leading British engine manufacturers.

Among the engine designs was the H-1 (supervised by the DH consultant designer Major F. B. Halford), work upon which started in April, 1941, shortly before the first flight of the Gloster-Whittle E28/39 on May 15. Within a year this engine, later to be known as the Goblin, was running well on the bench and an order was given to build a single-seater fighter around it.

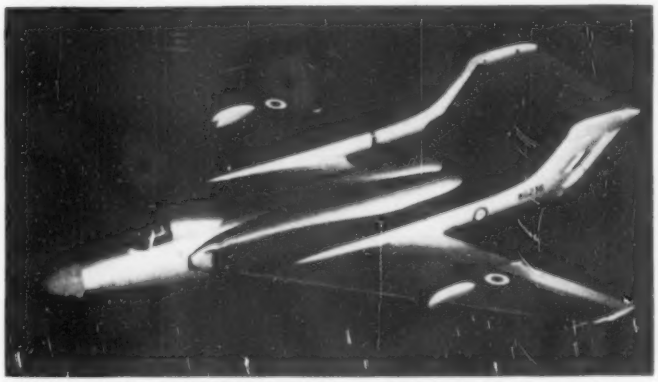
The first Vampire flew Sept. 20, 1943. This was a triumphant day for the makers; their first jet aeroplane powered by their first turbine engine flew successfully and shortly afterward it became the first Allied airplane to exceed 500 mph.

De Havilland plants were then fully occupied and pilot production of 120 aircraft started at the English Electric Co. Partly because of this devolution of responsibility, the Vampire did not reach squadron service until after the war.

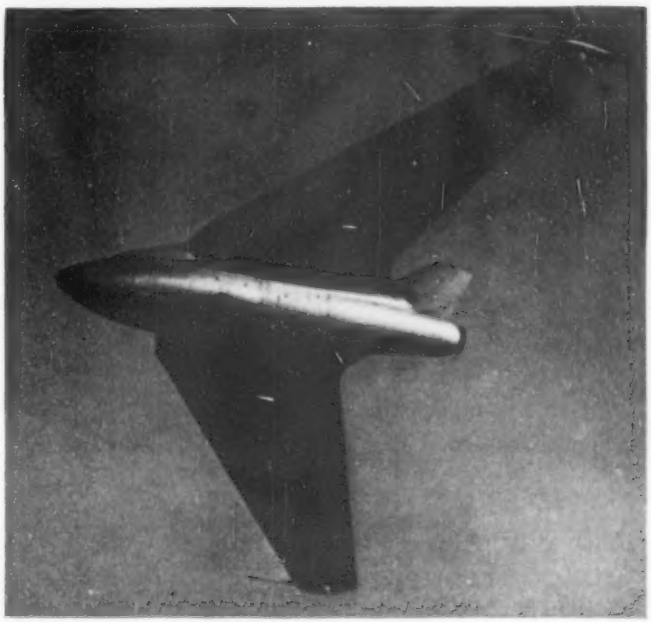
▶**Tradition Forsaken**—Design of the Vampire was a break with tradition for fighter airplanes. Not only did it have a jet engine, but wood and metal construction were mixed and the tail boom layout was chosen. Tail booms have aerodynamic advantages, but their stress-design makes them difficult structures to handle. Prior to the Vampire, the P-38 was about the only tail boom aircraft to see service on the Allied side on any scale since the early days of strut-and-wire biplanes.

R. E. Bishop, de Havilland's chief Engineer on airframes, reviewed the requirements for a jet fighter and, in consultation with the Research and Development Branches of the Ministry of Aircraft Production and the Operational Requirements Branches of the Air Ministry (RAF) evolved the layout of the DH 100.

The short fuselage and tail booms



DH 110's SWEPT WING shows remarkable affinity to that of tailless, wooden . . .



DH 108 RESEARCH plane, used to develop 110's supersonic configuration.

From the Vampire 1 to the DH 110

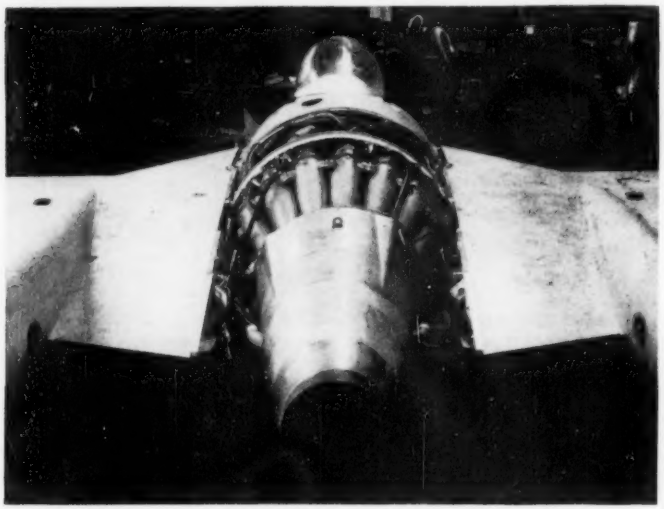
	ENGINE	SPAN	LENGTH	WING AREA	GROSS WEIGHT	MAX. SPEED	MAX. CLIMB	OPERATIONAL CEILING	ENDURANCE AND/OR RANGE
Vampire 1 (Crew 1)	Goblin 1 or 2; 3,000-lb. s.t.	40 ft.	30 ft. 9 in.	266 sq. ft.	8,000 lb.	540 mph.	—	45,000 ft.	—
Vampire FB 5 (Crew 1)	Goblin 2; 3,100-lb. s.t.	38 ft.	30 ft. 9 in.	262 sq. ft.	10,520 lb. to 12,290 lb.*	531 mph.	4,050 fpm. at sea level	40,000 ft.	2.35 hr.‡ at 350 mph. at 30,000 ft.
Vampire NF 10 (Crew 2)	Goblin 3; 3,350-lb. s.t.	38 ft.	34 ft. 7 in.	262 sq. ft.	11,350 lb. to 13,100 lb.*	535 mph. at 20,000 ft.	4,400 fpm. at sea level	40,000 ft.	2.70 hr.‡ at 310 mph. at 30,000 ft.
Vampire Trainer (Crew 2)	Goblin 3; 3,300-lb. s.t.	38 ft.	34 ft. 5 in.	262 sq. ft.	11,030 lb.	549 mph. at 20,000 ft.	4,500 fpm. at sea level	40,000 ft.	2.15 hr.‡
DH 108 (Crew 1)	Goblin; 3,500-lb. s.t.	39 ft. 0	24 ft. 6 in.	—	—	635 mph.	—	—	—
Venom (Crew 1/2)	Ghost; 5,000-lb. s.t.	41 ft. 9 in.	31 ft. 6 in. single; 35 ft. 3 in. two seat.	about 260 sq. ft.	about 14,000 lb. max.	about 630 mph.	6,000 fpm. plus	at least 50,000 ft.	—
DH 110 (Crew 2)	Two Avons.	—	—	—	—	650 mph. plus	—	—	—

* With external tanks filled.
‡ With t. o, climb, descent and 15 min. combat allowances.

were chosen to allow the engine to be mounted directly behind the nacelle without a jet pipe extension, and to give a clear run to the exhaust blast. At that time it was thought that the jet might spread through a much wider angle than 5 deg., and the tail was set high to clear it on early aircraft in the series.

The de Havilland turbojet, the Goblin, has a centrifugal compressor with high speed airflow characteristics, that is to say it is always sucking air faster than the airplane is traveling until it reaches speeds of about 500 mph. Because of this, ram pressure is of limited value and this was the main reason why wingroot intakes with curved ducts were adopted.

The engine is slung from the fuselage rear bulkhead, the accessories and fuel ring being accessible through hinged panels, while the whole engine is laid bare by removing the tail fairing. This question of easy engine accessibility was an important factor in the design decision, since it obviated uncoupling the tail unit or having a large stressed opening in the top of the fuselage.



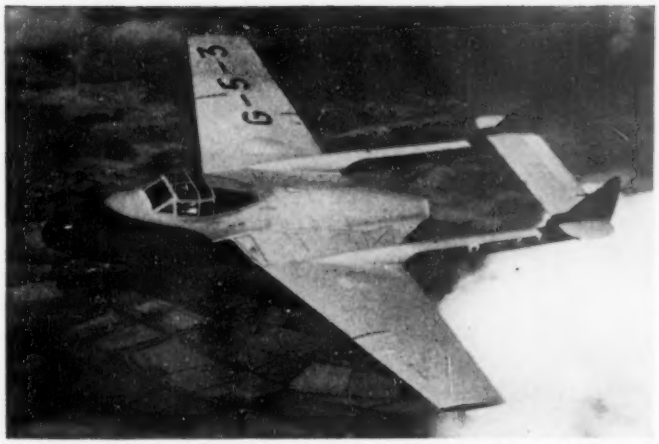
EASY MAINTENANCE access to Goblin engine is feature of Vampire series.

► **Wing and Tail Layout**—Wing design was made conventional for the period: symmetrical profile of moderate thickness, medium aspects ratio, conservative wing loading, two-way taper. This choice led to docile stalling characteristics, outstanding high-altitude performance, and exceptional maneuverability, coupled with a speed advance of a clear 100 mph. over that possible with the contemporary piston-engine fighters.

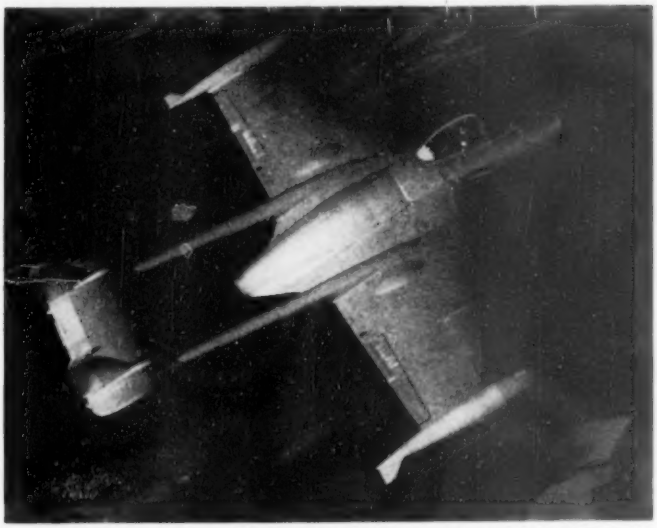
Two remarkable occasions followed from this aspect of the design: A Vampire was flown by Phil Garratt, DH Canada president, with no previous experience of aircraft faster than the prewar DH 89 feederliner; and, on Mar. 23, 1948, John Cunningham, DH chief test pilot, reached 59,446 ft. in a Ghost-Vampire with slightly extended wings, thereby establishing the airplane international height record that stands today.

Tail design with booms is tricky because the structure forms an open unbraced frame. The Vampire has the advantage of no engine vibration or slipstream buffeting to complicate results, but even so design was not easy. The two booms were made to run back along the line of flight and, once the jet was proved to have a narrow cone of expansion, the tailplane was brought as low as possible until it lay just above the wing wake.

Layout lent itself to an unusually



PROTOTYPE VENOM upon which Europe's standard night fighter is based.



SINGLE-SEAT version of the Venom with thin wing, torpedo-shaped tiptanks.

low-set landing gear, since there was sufficient rise in the tail booms to allow high-incidence touchdown without bumping. The short undercarriage was, light and also was an aid to accessibility—though the nacelle is actually so low that the cannon have to be serviced by a person on his back.

► **Structural Highlights**—From early days de Havilland made wooden airplanes. The Vampire nacelle was, therefore, made in the well-tried, non-strategic ply-and-balsa sandwich. Wing loads in highspeed maneuvers were considered to be too great for wood because wing thickness was too small to permit enough timber to be used for full development of stresses.

With almost symmetrical taper, a single straight I-beam could be used with light leading-edge, flap and aileron beams. A relatively thick skin and close-spaced spanwise stringers and ribs were chosen to complete a very rigid structure. Tail and booms, likewise limited by dimensions, were also designed in stressed-skin light alloy.

► **Development of the Series**—The evolution of the Vampire is bound up with the policies of the RAF and its buffer Ministries of Air and Supply, as well as those of the late Socialist Government.

While sweptwing jet fighters were in the development stage and doubts still existed about their practibility, the Air Council decided to stick to the Vampire and Meteor fighters in order to

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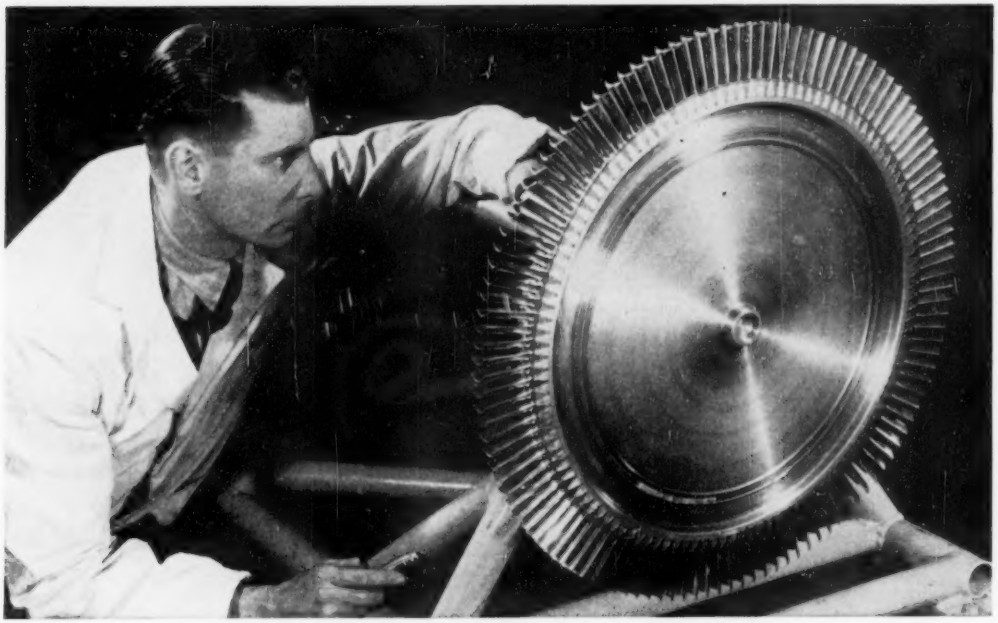

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build up jet experience, even though it was realized that these planes would soon be outclassed in speed. Limitations of cost and of manpower made it imperative to restrict production to these two types until a clear picture of future needs and achievements could be formed.

When the Socialist Government decided there was need for rearmament plans were made to increase Vampire orders and convert the expanded production lines later to the basically similar Venom interim fighter.

Development of the Vampire proceeded at first in a series of detail steps The first 50 Mark 1s had no pressurization and a small sliding hood; then the blown bubble hood came in, together with a 3-psi. cabin pressure system.

In the Mark 3, wing fuel capacity was increased and Marflex flexible cells were used throughout. The tail plane was lowered and the opportunity taken of returning to the "DH rudder" shape —hallmark since 1916.

Next was the FB 5 in which a foot of wingtip was removed each side to improve rate of roll and maneuverability for ground-attack duties. Wing structure was also beefed to carry external stores—eight rockets and two 500-lb. bombs, or two 1,000-lb. bombs.

The FB 6 came next with the 3,300-lb.-thrust Goblin 3 and improved performance. The FB 9 added refrigeration to make the pilot's life more comfortable in the troprics.

From the start, the Vampire has had a good endurance for a jet, both with and without external tanks, and this, together with its maneuverability, suggests that its useful life as a fighter-bomber or night interceptor is far from drawing to a close.

► **Sideshoots**—As a precaution against failure of the Goblin in service, the Mark 2 Vampire was built to specification F11/45 with the Rolls-Royce Nene. Air scoops in the top of the nacelle delivered air to the rear side of the double-sided compressor. This version had a good climb, but the engine was starved at speed, so Boulton Paul was asked to modify the wing structure to duct air to both sides of the compressor.

This version was further modified by French licensee Societe Nationale de Constructions Aeronautiques du Sud-Est as the Mistrale and put into limited production at Marseilles to take the French Hispano-Suiza Nene. Australia also adapted the Vampire to locally built Nenes.

In 1947 a stripped Vampire 1 was fitted with a 5,000-lb. Ghost engine, its wings extended by 8 ft. to reduce the span loading and flown to nearly 60,000 ft. With this airplane much was learned about true stratosphere flight and it was developed into the Mark 8—

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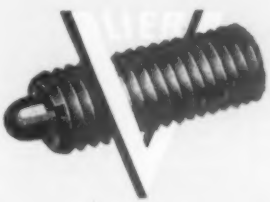

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HS 37 Close Tolerance 100° Countersunk Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
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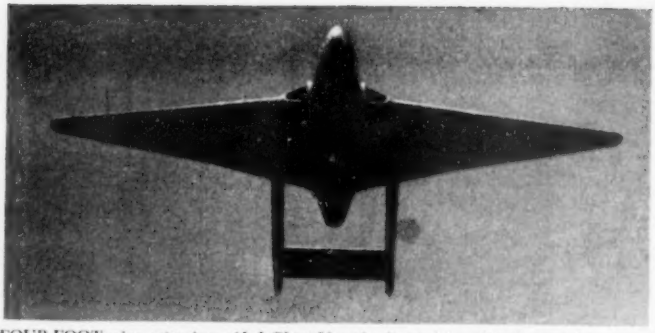
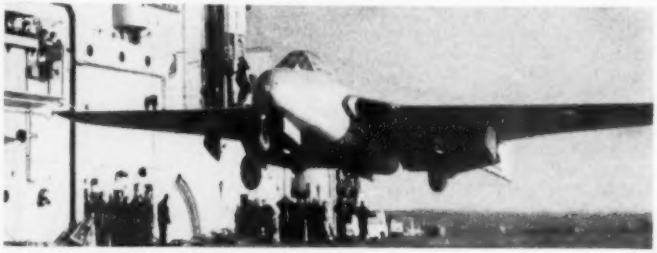


FOUR-FOOT wing extensions aided Ghost-Vampire in attaining altitude record.

EARLY VAMPIRE 1 with small hood, high stabilizer, angular rudder, rounded wingtips.



PROTOTYPE SEA VAMPIRE, with enlarged flaps, leaves deck of British carrier.

which in its production form was rechristened the DH 112 Venom.

With its mild behavior the Vampire was a natural for carrier work and Dec. 3, 1945, made the first jet deck landings and takeoffs. This aircraft, the Sea Vampire, had its divebreak area increased 35%, flap area 40% and an arrester hook hinged to the wing root and stowed above the jet pipe.

A small number of Sea Vampires (called the F20 to avoid confusion with any land Vampire marks) was built for and used by the Royal Navy for training—wings are strengthened to take acceleration and deck landing shocks. The Sea Vampire 21 is an important experimental development, since it has a strengthened fuselage to enable it to alight without wheels on an inflated rubber "flexible" deck. First tests were made successfully early in 1949 and an unofficial demonstration took place at last year's SBAC display.

► **The Venom**—An ingenious and economic adaptation of the Vampire is the DH 112 Venom, which first flew Sept. 2, 1949, and is now entering service with the RAF. This craft is also in production at SNCASE in France, and is being tooled by Fiat and Macchi in Italy.

Following upon Socialist reluctance to spend on armament came the scheme to improve upon the limiting Mach number of the Vampire series without complete tooling for a new type. Beefed-up nacelle and tail of the Venom are built on Vampire jigs, at a considerable saving.

The wing is quite new, being of thin highspeed profile and having all its taper on the leading edge, giving about 20 deg. of sweep. Because, as in the Vampire, main landing gear retracts outward, thinner shock struts and wheels have been fitted; but even so they cause slight blisters on the new

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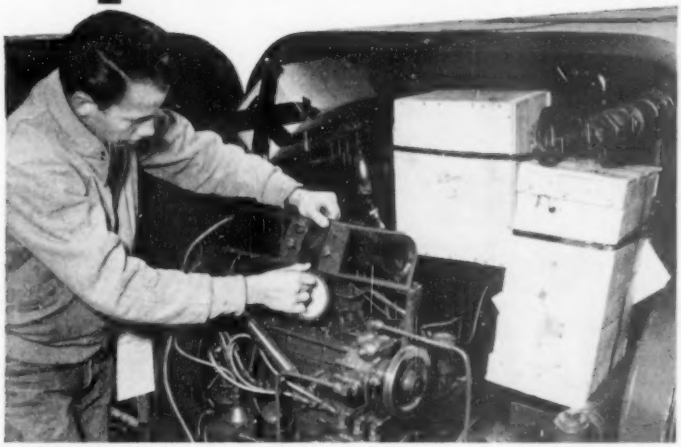
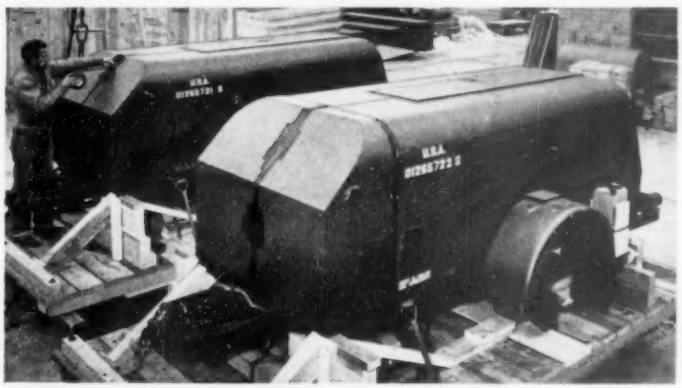


TAPING SHUT the ignition key slot on the Army's mobile shower unit. Worker uses Polyken Tape No. 214. You can see where he's already sealed a packaged fire extinguisher (upper left), a valve outlet (upper right), as well as the instrument panel which he is just completing.



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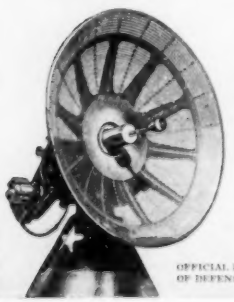

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wing. The Vampire fuselage has been adapted to hold a Ghost engine and a Martin-Baker ejector seat.

Official reticence prevents the quoting of Venom data other than the main dimensions: Span 41 ft. 9 in., length 31 ft. 5 in. However, despite an obvious weight increase due to extra fuel for the two-thirds greater thrust (three-fifths endurance would scarcely be an acceptable alternative) and some more weight from the ejector seat, the wing loading has been kept down to the 45-50 lb./sq.ft mark and the Vampire's exceptional maneuverability and altitude performance have been retained. Maximum speed, due both to increased thrust and aerodynamic refinement, is up by about 100 mph.

Large torpedo tiptanks are standard on the Venom instead of the underwing tanks of the Vampire. Underwing loads of rockets, bombs or tanks up to 1,000 lb. a side can also be carried. As with most swept airplanes without slots, fences are fitted to control flow over the ailerons at low speeds.

▶ **The Two-Seaters**—The first two-seater in the family was the DH 113 night fighter, which flew Aug. 28, 1949, and entered squadron service with the RAF early this year as the Vampire NF 10. This airplane was built as a private venture after someone in the DH design team noticed that the Vampire fuselage was the same size as that of the Mosquito. Actually, by careful design the two-seat cockpit is 44 in. wide—6 in. more than the Mosquito. Space is sufficient for side-by-side seating—with slight stagger for radar scope—but not for ejector seats. Enlarged nose for the radar scanner, and larger cockpit hood have led to a bigger fin and rudder as compensation.

From the Vampire night fighter it was but a step to evolve the DH 115 jet advanced trainer (also a private venture) which flew almost exactly a year later and is now beginning to go into service with the RAF.

The two-seater Venom night fighter is not a private venture, but the result of Admiralty and RAF co-operation. It is virtually a marrying of the DH 112 with the DH 113 plus the extra urge of an afterburner. The latter gives some 20% extra static thrust for takeoff and 40% more for climb—it is not needed for level flight as the aircraft can reach its limiting Mach number without it. To improve cruising efficiency a petal-type variable nozzle—the first on a production airplane—is fitted.

The two-seater Venom, already rolling out for the RAF and the Royal Navy (which regards it as its principal jet fighter for some years to come), is also under way in France. The Italians have serious ideas for building 1,000 plus—both for themselves and as export to other NATO countries. The Italians

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base their faith in the Venom partly upon its virtues, partly on the knowledge that the U.S. cannot supply Europe's crying need, the jet night fighter.

▶ **Next Stage**—The Vampire and Venom are filling much of the need for single-seat jet fighters until the arrival of advanced sonic types, such as the Hawker Hunter, Supermarine Swift, and possibly the Boulton Paul delta. The two-seaters do the same for night interception. The Vampire is fast enough to tackle any enemy piston-engined bomber—and the enemy's main force still consists of these—while the Venom can catch his present jet bombers. Neither, however, has the size or power to carry the half-ton of electronics necessary for all-weather patrols—particularly in the unsettled weather of Great Britain and the northern shores of Europe. Only two engines can provide the power for sonic flight with such a load and that leads to the DH 110.

Back in 1945 the Ministry of Supply was interested in the possibilities of tailless aeroplanes and so sponsored the extensive delta-wing program and a few "conventional" tailless types.

Among these was the DH 108, three of which were built as research types mainly to investigate the possibilities of this layout for the Comet airliner. The DH 108 was built at very low cost, using a Vampire fuselage onto which was built a sharply-swept wooden wing, fin and rudder. Design and construction took only eight months, from October 1945 to May 1946, including extensive model tests in the RAE high-speed tunnel at Farnborough. Much was learned about handling of this type of airplane both at high and low speeds —enough to decide against it both for the airliner and for future fighters.

The DH 108 was very fast for the 3,500-lb. thrust given by its Goblin engine, reaching about 635 mph in level flight. One aircraft was lost with Geoffrey de Havilland, Jr., when it broke up at high speed—possibly because of cabin hood failure—but on Apr. 12, 1948, another aircraft set up the closed circuit 100-km. record at 605.23 mph., the first time 600 mph. had been exceeded for that distance.

Also, on Sept. 6, 1948, John Derry was the first British pilot to exceed Mach 1.0 in a shallow dive from 40,000 to 30,000 ft. with the craft. This was a compliment to the aerodynamics of the DH 108, because its engine power was much smaller than needed since to achieve such speed.

Flight experience with the plane convinced Bishop that there were many virtures in the highly swept wing, but that they could be bettered with the help of a stabilizer. So, when the Ministry of Supply issued its 1948 specification for an all-weather fighter, the

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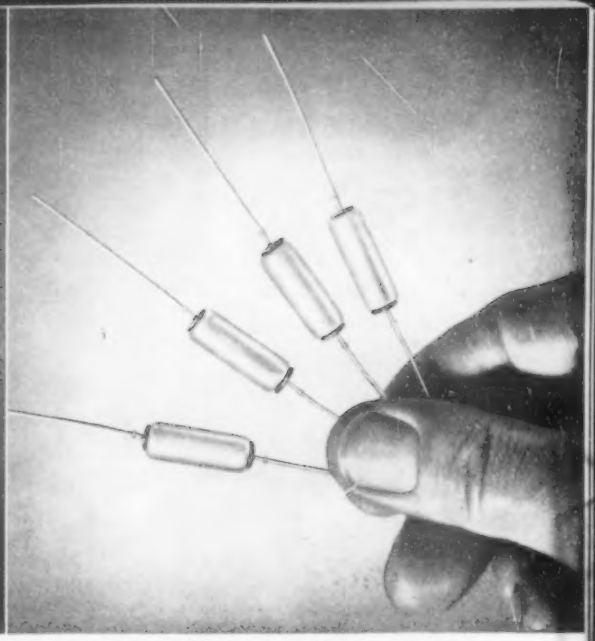

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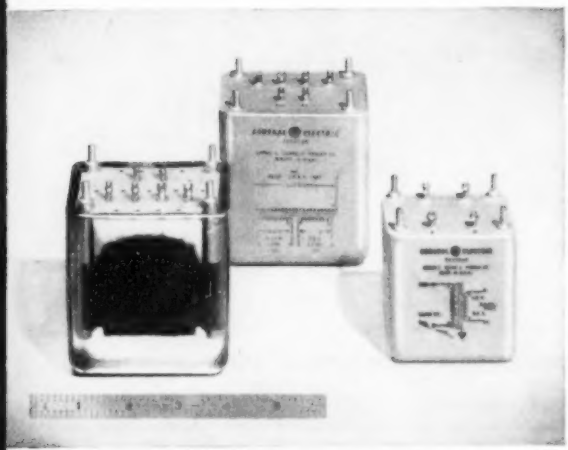

NEW CAST-PERMAFIL HERMETICALLY SEALED TRANSFORMERS for radar and other electronic equipment are lighter and 20% smaller than present models. Unit on left is cast in clear plastic to show internal construction. Designed to meet MIL-T-27 Grade I, the new transformers are now available in limited quantities for developmental programs.

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Announced simultaneously was a new order for Super Constellations placed by Linea Aeropostal Venezolana. LAV also made their selection after careful consideration of the finest competitive equipment. This choice is backed by their long previous experience with dependable Constellations.

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4. It has longer range than any other commercial airplane.

5. It can match in speed the competitive schedules of any airliner.

6. Operators like it because travelers like it—for dependability, luxury and speed.

Thus the Constellation and now the Super Constellation are currently playing a vital role in profitable airline operation, at the same time giving assurance of future profit because of the built-in "growth factor" not found in any other airplane.

DH 108 layout formed the basis of the new project. In other words, the new airplane, despite its tail booms, is an indirect descendent of the Vampire.

►**DH 110**—Security still officially restricts knowledge of the DH 110 to what can be adduced from photographs.

Using the DH 108 wing plan, the designer has achieved a combination of high sweepback and large wing area which should give good high-altitude and high-Mach characteristics with a turning circle not unduly restricted by wing loading or shock stall. The addition of the high-placed elevator and adjustable stabilizer give enough trim for landing flap and Mach effects. Thickened wing roots, where the intake reduces the aerodynamic thickness, and a plump nacelle help to accommodate a large fuel supply.

Embryonic tail booms merge into two vertical fins equipped with small rudders. The first guess at tail areas allowed too much stress on directional stabilizing from the wingtips and additional fin area was soon added at the ends of the booms.

The stabilizer is well above the wing wake at all speeds and is adjustable for about 15 deg. about the rear beam. The high tail and boom layout allows divebrakes to be mounted across the top and bottom of the fuselage, no perforations being necessary in the brakes.

The nacelle is large because of the search and blind-landing avionic equipment and the crew of two. The nose is a plastic radome; the pilot sits to port in a small raised hood; the observer is below and to starboard. Notices on the fuselage show that each member of the crew has a Martin-Baker ejector seat, the observer has an escape hatch in the roof.

The Rolls-Royce Avon axial jets are mounted close together to permit good single-engined cruising. Fat tail pipes indicate the probability of afterburners with the new petal-type controllable nozzles. Wing-root air intakes follow Vampire design closely, with shoulders to part the fuselage boundary layer. Scoops in the shoulders indicate that a use has been found for the sluggish air flow, probably for cooling generators or other auxiliaries.

Landing gear of the DH 110 is a beefed-up version of the Vampire's; lever-action nosewheel leg and piston-type main legs retracting inboard.

Although the RAF recently chose the Gloster GA 5 Javelin delta for its new all-weather fighter, a second order for the D H110 is almost certain. Already de Havilland has been offering the type abroad, where the Vampire is so well known that it starts with a considerable advantage in post-sales organization. Price quoted was around $380,000: airframe $109,000, two engines $109,000, and the rest equipment.

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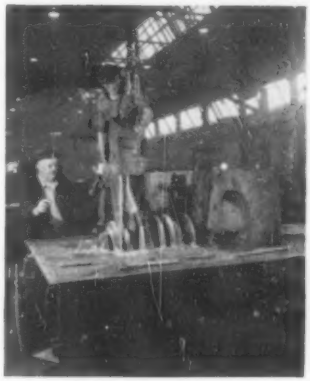

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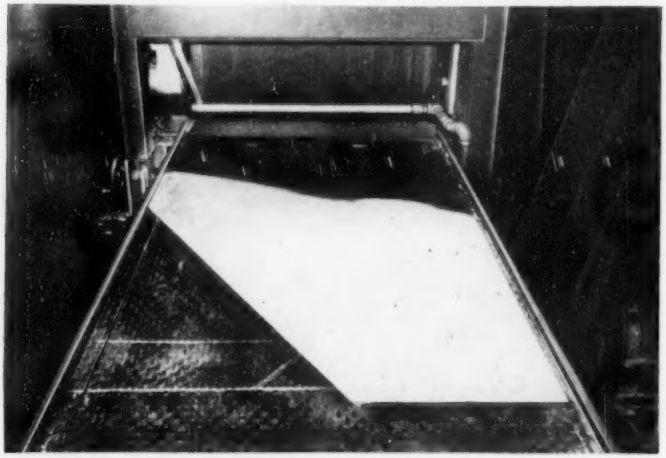
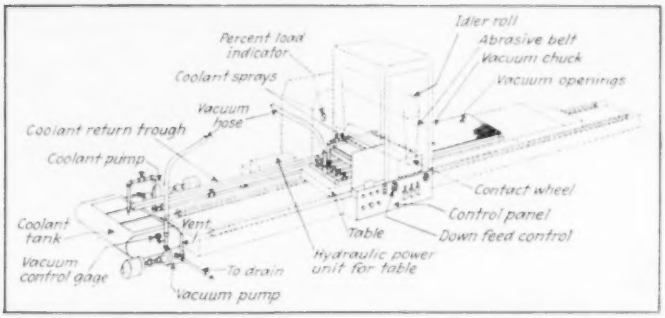


SHEET held on table vacuum chuck passes under wide abrasive belt for tapering job.



MODIFIED polishing machine used for trial runs in abrasive-belt sheet tapering.

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By Irving Stone

Niagara Falls, N. Y.—Abrasive belts that can chew off metal stock at a phenomenal rate are being made here by the Carborundum Co. In one demonstration with 1-in-dia. 1020 cold-rolled steel rod, about 1¼ in. of the metal was ground off in 12 sec.

And now Carborundum Co. is adapting the grinding power of these abrasive belts to simplify an important aircraft production job—tapering of skins. The company says this is the first time any real wide stock removal has been done with abrasive belts.

► **Bell Cooperates**—So far, Carborundum's Coated Products div.'s work in this field has been on a development basis, in close cooperation with Bell Aircraft Corp.'s production engineers. Runs have been made on a modified Hill Acme polishing machine for the purpose of demonstrating how skin can be tapered quickly and accurately. Results have indicated that the basic scheme offers many possibilities—lower costs, better finishes, improved production rates, and lower capital investment.

As a result of Carborundum's and Bell's development work, a new machine is in the works at the Hill Acme Co., Cleveland, embodying the necessary refinements for a production job. This type of unit, it is reported, can be delivered in eight to nine months, with additional units available every six to eight weeks thereafter.

Cost will be in the $100,000-$150,000 range. Carborundum's basic interest in the process is utilization of its abrasive belts for the tapering job.

► **Machine Adapted**—The machine that Carborundum used for its experiments in skin tapering is a wide-belt 50-hp. unit normally used for polishing sheet. A 100-hp. motor is installed to replace the 50-hp. unit and a vacuum chuck and a circulating cooling system are added.

A Carborundum-developed serrated rubber-faced contact roll (Type 61) is used to drive the abrasive belt and support its grinding action. Serrations on the contact wheel prevent the material from loading up. An idler roll maintains proper tension on the belt. Machine undercarriage is not altered.

Rubber tubing cemented into grooves ground in the chuck face is connected to a vacuum source to hold the skins firmly against the chuck.

► **Tapering Job**—Here's how Carborundum performs the grinding job on the experimental machine:

With vacuum pump on and the 4×8-ft. aluminum sheet drawn down firmly, a few flat passes are made under a fast cutting 36-grit silicon carbide belt to insure uniformity in thickness of the commercial sheet.

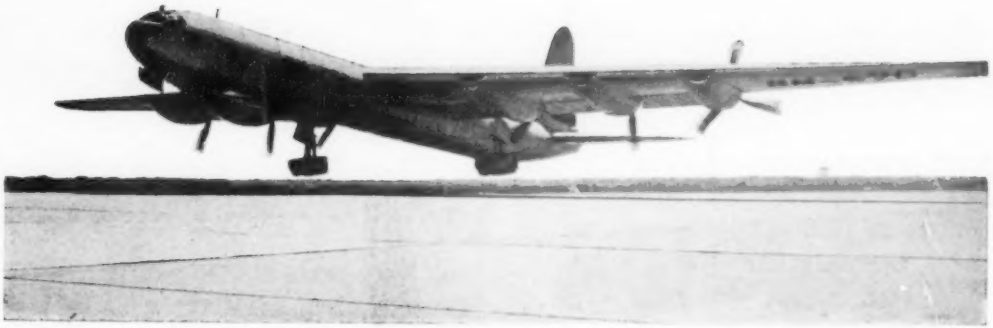
Coolant is a 40-to-1 composition of water and soluble oil, with high-pressure pumps spraying the mixture at the belt grinding line. Coolant flow is about 30 gpm. to insure a cool cut and chip washaway. However, stock removal is so fast that a broom has to be used to supplement the wash.

A switch to a 150-grit silicon carbide belt (40 sec. change time) and a few passes give the finish required for the flat sheet.

For the tapering job proper, the table is jacked up and shims placed under the table supports. Specified tapers are produced with proper size shims. Once the table has been shimmed for the taper required it is only necessary to downfeed an amount equal to total depth of stock to be removed at the thin edge. Belt downfeed is controlled by a micrometer-dial handwheel, with each turn equaling .015 in.

Table speed can be varied from ½ to 10 fpm. A safety control automatically raises the grinding head if the chuck vacuum drops to an unsafe value. If the belt breaks, the table automatically drops to give safe clearance.

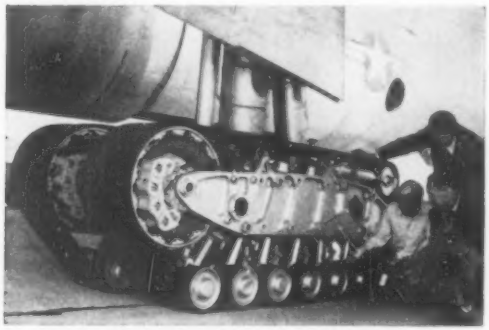
► **Rough, Then Smooth**—For deep cuts on the taper, the 36-grit belt is employed, driven at 6,200 sfm. Short



WORLD'S LARGEST BOMBER. Here's the first experimental model, the XB-36, taking off with track-type landing gear at Fort Worth division of Consolidated Vultee Aircraft Corporation.

XB-36 NOW USES TRACK-TYPE LANDING GEAR

...vital parts made from Nickel Alloy Steel save weight



TRACK-TYPE LANDING GEAR ON THE XB-36. The main gear, shown here, is designed for a minimum average of 57 p.s.i. on the landing strip as compared to a pressure of 156 p.s.i. exerted by conventional wheel-type gear on a B-36 of the same gross weight. Crucible Steel's "HY-Tuf" nickel-alloyed steel is used to reduce weight of the gear without sacrificing safety.

This giant bomber shows the latest step in development of a track-type landing gear by the U. S. Air Force...

Essentially interchangeable with, but not intended to supersede conventional wheel-type gears, the track-type provides basic advantages for certain locations and conditions of operation by distributing weight over a larger area of the landing strip.

Weight of this new gear was cut below the original estimate by some 2000 pounds... due to good design and wide use of "HY-Tuf," a patented nickel alloy steel developed by the Crucible Steel Company of America, for highly stressed parts.

The typical composition of "HY-Tuf" is:

Carbon	0.25%	Nickel	1.80%
Manganese	1.40	Molybdenum	0.40
Silicon	1.50		

It can be heat treated to at least 200,000 p.s.i. tensile strength with an Izod impact strength of more than 20 ft. lbs. This unique combination of strength and toughness permits reduction in size and corresponding savings in weight of parts so vital to success of track-type landing gear.

In fact, nickel-containing alloys provide essential stamina for reducing excess weight in components of standard wheel-type landing gears, jet engines, piston engines and other equipment subject to extreme stress.

At present, most of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel steels for many end uses in defense and defense supporting industries.

SCRAP that is properly segregated goes back into production faster. The booklet, "Rapid Identification of Pure Metals and Alloys" is designed to make it easy to test and classify a wide range of metals. Write for a free copy.

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Jet Development

Pratt & Whitney Continues to Expand Its Development and Test Facilities

PRATT & WHITNEY AIRCRAFT is taking another step forward to meet its heavy responsibility of providing the nation's armed forces with the best possible aircraft engines in the shortest time possible.

To keep up with our expanding role in jet engine development and production, we are undertaking a privately financed program, costing many millions, to enlarge our present jet engine development and test facilities.

As it stands today, the Andrew Willgoos Turbine Laboratory is the most complete privately-owned jet development facility in the world. This new expansion will greatly enlarge its capabilities. For example, at this time one of the Willgoos Laboratory's four test cells is especially equipped for high altitude testing. When this program is completed, three additional cells of even more advanced design will be available for testing turbine engines under conditions simulating supersonic speeds and altitudes of up to 55,000 feet. In addition, a number of experimental test cells in our East Hartford plant, which were formerly used to test piston engines, will be converted to accommodate jet engines, providing additional facilities for testing both components and full scale engines.

This constant expansion of test facilities is only one phase of our effort to make sure that America will have the finest aircraft engines built. Just as important is the continuously increasing effort in all phases of engineering that goes into every Pratt & Whitney engine.

Our expansion program is a major effort. It has already taken endless hours of planning and hard work. But the results will enable us to do a good job better—and faster. In the end, it will be an important investment in national defense.

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passes with heavy stock removal begin at the tip of the sheet and become progressively longer as the operation proceeds.

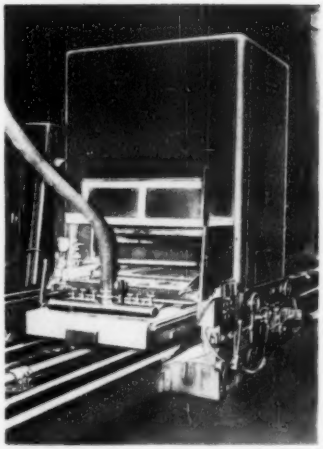
It has been found that deep cuts can best be made when table movement is opposite to that of belt direction. Carborundum reports that successful cuts up to 0.1 in. have been made over the entire width of sheet, and that maximum measured surface temperature of the sheet is only about 90F.

The taper is generated to the approximate final dimensions with the 36-grit belt. For finishing, a switch is made to a fine grit belt—usually not more than two of these finer grit grinders being needed for final finish.

As in other machining processes, Carborundum says that ground chips are salvable. Coolant, with water softener added, is kept relatively free of chips through use of a settling tank and screens. In the new machine, commercial filters will be used.

▶ **Comparisons Made**—Carborundum says that the abrasive belt method performs tapers in both directions—by cocking the table. Tapering skins by the rolling method, Carborundum says, permits only one taper.

The company reports basic findings on the abrasive belt method compared with the skin milling method—



CLOSEUP showing serrated rubber contact wheel (under hood) and vacuum hose.

"the only practical alternative available at the present time."

Here are Carborundum's general opinions on abrasive-belt tapering vs. skin milling:

• **Stock removal:** The belt method is the only one at present which can produce finished skins at a fast rate; depending on the taper involved and the amount of stock to be removed, belt grinding is 5 to 10 times faster than other known methods, company says.

This rapid stock removal results because the cutting surface is applied to the entire width of the work. Cuts up to 0.1 in. have been made with the abrasive belt over the entire width of a 48-in. sheet and there's no reason to assume that equally heavy cuts cannot be taken regardless of sheet width, Carborundum reports.

Skin mill fly cutters, it says, are practical only in the 10- or 12-in. diameters and the maximum width of cut is thereby limited.

• **Roughing and finishing:** The belt-type machine not only removes the stock, but also by changing to a finer grit belt the polishing operation can be completed—on the same machine.

Using milling methods, this polishing of the rough milled sheet is a supplementary and time-consuming operation, often taking as much time as the rough milling, Carborundum says.

• **Loading and unloading:** With the use of a vacuum chuck and possible vacuum handling devices, quick and steady fastening of the workpiece is achieved in the abrasive belt system.

Present milling methods utilize time-consuming clamping and intricate jigs, Carbordundum claims. (The largest skin mill—the Giddings & Lewis machine operated by Lockheed Aircraft Corp.—incorporates vacuum holding, as

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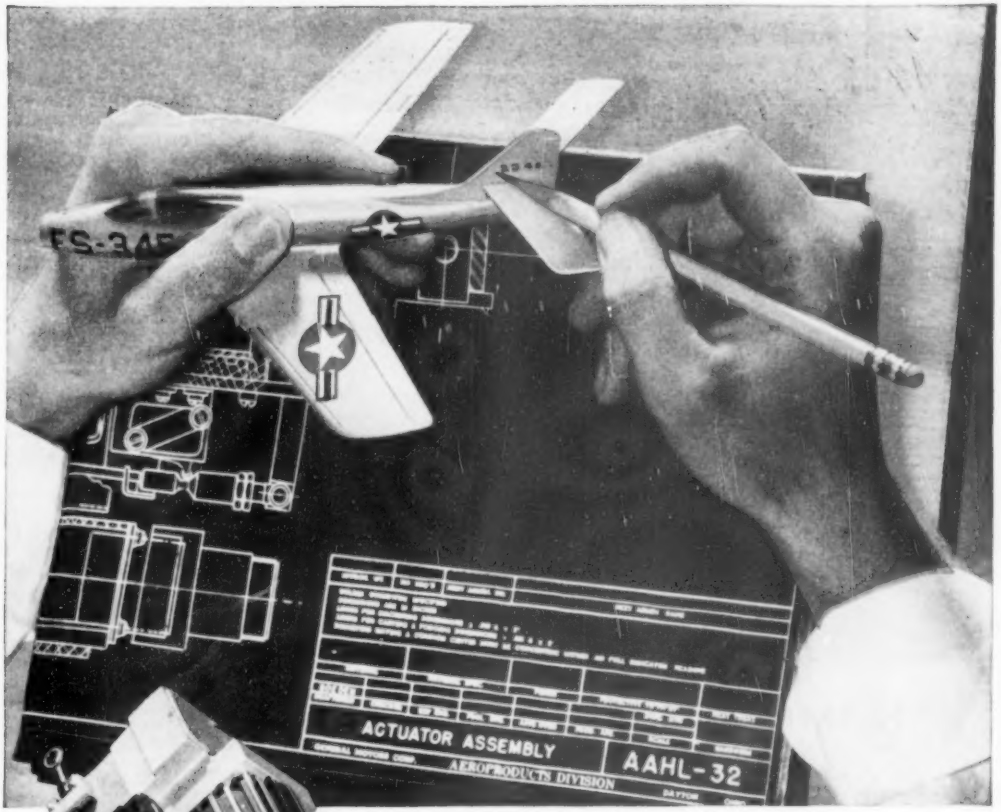

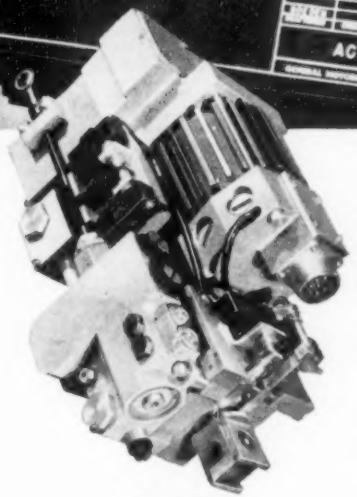

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Definite applications of this unit now being readied for production are for:
Republic F84F Flyable Tail • McDonnell F3H-1 Horizontal Stabilizer
Others unannounced.

APPLICATIONS

- Stabilizer Control
- Jet Engine Variable Nozzle Control
- Dive Brakes
- Variable Wing Incidence
- Flap Actuation
- Aileron Control
- Variable Wing Sweep
- Bomb Bay Door
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- Landing Gear
- Turret Control
- Canopy and Seat Control

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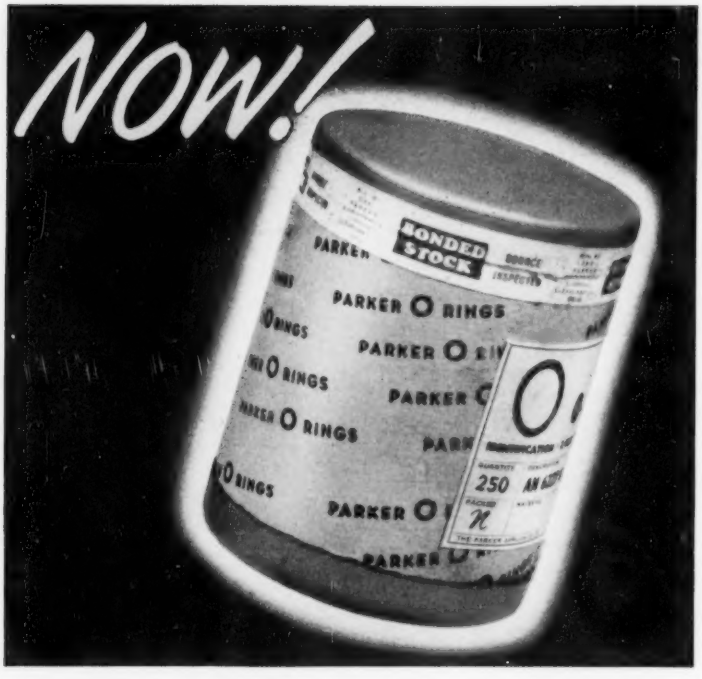

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well as mechanical holdown on the periphery of the sheet.)

• **Quantity factor:** Carborundum reports that, according to many wing specialists, present methods could not hope, with present planned milling machine capacity, to fill actual wartime needs; and that it has been said that preliminary design of aircraft has been restricted somewhat due to lack of suitable production methods for tapering skins.

• **Personnel needed:** With the abrasive belt machine, one fairly good machinist and helper can do all that is required after a few days of guidance.

On one large skin milling operation, Carborundum's information is that it required two months training to teach a man to run the mill, such a unit requiring three to four skilled men. It says that even on the small 48-in.-wide mill an extra semi-skilled helper is needed.

• **Setup, downtime:** With respect to cutting heads used on skin mills, Carborundum observes, 15 to 30 men are required for setting the head in position to cut, an operation that must be repeated for each sheet.

With belt grinding, this factor is almost completely eliminated, establishing contact with the work only being needed.

• **No tool maintenance:** When worn out, abrasive belts are discarded.

Single-point carbide tools last from 8 to 12 skins before resharpening. After this they must be balanced in the circular head and ground to within a ±5 grams to avoid excessive chatter from the cutting head high rpm.

• **Precutting:** Belts remove stock sharply, cleanly and with a minimum of drag, thus enabling sheets to be tapered to the very minimum thickness without danger of being lifted from the chuck. With the belt method, sheets can be precut to size and finish-tapered.

The company reports that due to the inherent tearing action of milling cutters on thin stock, precutting is not practical in most cases.

• **Accuracy:** Commercial tolerance reported for the abrasive belt method is ±.005 in. This can be bettered, the company says, adding that no other method will produce a more accurate surface under commercially practical conditions. The belt will give finishes as as low as 10 micro-in. rms., while skin mills leave lap marks which must be polished out, explains Carborundum, with micro finishes comparable to those of the belt being difficult to obtain by hand polishing.

Belt grinding keeps the work temperature below 100F to obviate metallurgical changes, while skin milling, it says, creates high heat which often causes the work to buckle, occasionally resulting in costly rejects.

• **Cost factors:** Under experimental conditions, abrasive costs were 12 to 15 cents per pound of aluminum removed.

Milling costs available from its study, Carborundum says, indicate a corresponding price of between $1.30 and $1.80 per pound of aluminum removed.

The company feels that under production conditions the belt method experimental costs can be cut still further.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by the Air Materiel Command.

Jack & Heintz, Inc., 17600 Broadway Ave., Cleveland, electrical starters, 333 ea., $84,737.

Lear, Inc., 110 Ionia Ave., Grand Rapids, Mich., spare parts, $1,000,000.

Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo, spare parts, $171,402.

Lion Uniform Co., 44 Webb St., Dayton, flying suit, $320,072.

Lurin Eng. Corp., 500 Fifth Ave., N. Y., hangars, Luria, 4, ea., $828,700.

Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif., workshop units, 225 ea., $73,125.

Marlin-Rockwell Corp., 402 Chandler St., Jamestown, N. Y., ball bearings, $190,930.

Marman Products Co., 11214 Exposition Blvd., Los Angeles, coupling clamps, $38,556.

Mearl Corp., The, 153 Waverly Place, N. Y., charges, fire extinguisher foam, 600,000 gal., $752,100.

Mercury Trading Corp., 157 E. McMicken Ave., Cincinnati, radio receivers, 31 ea., $39,525.

Minneapolis-Honeywell Reg. Co., Brown Instr., Wayne & Windrim Aves., Philadelphia, valves, switches, pneumatic relay, $32,007.

Monadnock Mills, 1977 First Ave., San Leandro, Calif., cowling stud fasteners, $6,643.

Motch & Merryweather Machinery Co., The, Cleveland, lathe, vertical turret, 2 ea., $121,399.

National Brush Co., 101 Illinois Ave., Aurora, Ill., scrub brushes, 173,160 ea., $39,307.

New Departure div., G. M. C., Bristol, Conn., ball bearings, $61,200.

Norma-Hoffmann Bearings Corp., Stamford, Conn., roller bearings, $232,240.

Norton Co., Worcester, Mass., grinder, 7 ea., $476,772.

Ohio Screw Products, Inc., 818 West St., Elyria, Ohio, plug, $51,946.

Oliver Machinery Co., The, Grand Rapids, jig saws, 49 ea., $53,900.

Pesco Products div., Borg-Warner Corp., 24700 North Miles Rd., Bedford, Ohio, maintenance parts, $161,479; fuel booster pumps, $230,705; hydraulic pump assembly, $72,338.

Phaostron Co., 151 Pasadena Ave., So. Pasadena, Calif., generator field control relay, 3,512 ea., $85,164.

Pittsburgh Plate Glass Co., 2000 Grant Bldg., Pittsburgh, spare parts, $38,460.

Porter Cable Mach. Co., Syracuse, N. Y., grinder, 20 ea., $29,696.

Revere Electric Mfg. Corp., 6009 Broadway, Chicago, light assembly, $89,652.

Safetee Glass Co., 4717 Stenton Ave., Philadelphia, sheet glass, $56,276.

Scintilla Magneto div., Bendix Aviation Corp., Sidney, N. Y., spare parts, $126,552.

Shaw Television Corp., 195 Front St., Brooklyn, N. Y., relay test set, 426 ea., $50,222.

Simmonds Aerocessories, Inc., 105 White Plains Road, Tarrytown, N. Y., spare parts, $58,347.

Singer Sewing Machine Co., Singer Bldg., 149 Broadway, N. Y., sewing machine spare parts, 112,998 ea., $38,143.

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, ball bearings, $342,425.

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Engineers of the Piasecki Helicopter Corporation chose MICRO precision switches as precise and dependable components of their HUP Tandem Utility Helicopter. This tandem rotored ship is specially designed for shipboard service.

The MICRO units prevent the clutch from being engaged when the rotor blades are dephased; provide positive prevention of accidental hatch opening; and guard against brake burnouts by insuring that the transmission is disconnected when the rotor parking brake is engaged.

Selection of these MICRO units by Piasecki engineers is typical of the confidence placed in MICRO by the aircraft industry. They know MICRO precision switches to be good aircraft design because they combine extremely small size and light weight with a dependability, a ruggedness and a resistance to vibration and acceleration that are unsurpassed.

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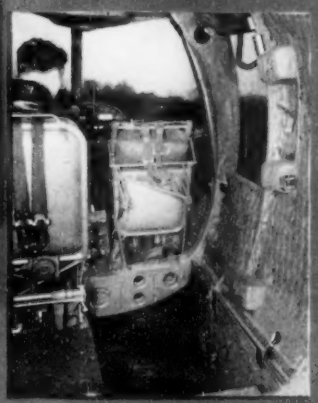

Interior of HUP Helicopter showing escape hatch open. A MICRO unit prevents this hatch being opened by mistake.

Piasecki Helicopter Corporation's HUP Tandem Utility Helicopter in flight. MICRO precision switches play important parts in its operation.

perform 3 important functions
Corporation's new HUP

Three of the MICRO precision switches which Piasecki engineers selected for use in the HUP

Shown at the right are three MICRO units which perform important functions in the operation of the Piasecki HUP helicopter.

1. MICRO DB-RH2 is a double-pole, double-throw precision snap-action switch assembled in an aluminum die-cast housing. The heavy switch spring construction gives high resistance to vibration. The heavy-duty plunger actuator is built to withstand hammer-blow operation. In the HUP this switch is tied to the clutch actuator circuit to prevent the clutch being engaged when the rotor blades are dephased. It also flashes a warning light to signal that the blades are in dephased condition.

2. This is a MICRO BZ-R31 (AN3210-1) switch with MICRO Auxiliary Actuator MC7711 (AN-3167). It is used as a combination locking switch and actuator on the rescue hatch installation. It is connected to the manual latch on the hatch and holds the circuit of the hatch motor open when hatch is closed.

3. This MICRO BZ-7RST (AN-3215-1) is a single-pole, double-throw type "S" plunger basic switch. It is connected to the clutch actuator and guards against brake burnouts by preventing clutch engagement when the rotor parking brake is engaged.

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Smith, A. O. Corp., Pacific Coast div., 5715 Smithway, Los Angeles, fabrication of spare parts, $90,450.

Son-Chief Electrics, Inc., 41 Meadow St., Winsted, Conn., tube, pitot, 4,083 ea., $48,996.

Southern Bolt & Screw Co., 4807 So. Boyer Ave., Los Angeles, bolt, 1,630,900 ea., $40,078.

Specialty Products Co., 1965 E. 66th St., Cleveland, coupling clamp, 20,500 ea., $37,925.

Steplight Products Co., 315-317 Forrest Ave., N. E., Atlanta, Ga., extension assembly, 7,024 ea., $131,321.

Stop Fire, Inc., Union Parts Mfg. Co., Inc., 125 Ashland Place, Brooklyn, N. Y., extinguisher, 13,000 ea., $155,650.

Tuffet Radio & Television Co., 2536 Belmont Ave., N. Y., interphone control, $105,663.

Tru-Fit Trousers, 1129 Woodmore Ave., Traverse City, Mich., radio carrier vest, 15,063 ea., $59,800.

United Manufacturing Co., 180 Whalley Ave., New Haven, Conn., test stand, $52,846.

U. S. Gauge div., American Machine & Metals, Inc., Sellersville, Pa., torque pressure transmitter, 6,561 ea., $869,121.

United States Rubber Co., Mishawaka, Ind., fuel cell fittings, $226,558.

United Steel & Wire Co., Battle Creek, Mich., maint. platforms, $3,225,663.

Vendo Co., The, 7400 E. 12th St., Kansas City, Missouri, bolt assembly, 18,668 ea., $47,902.

Waco Aircraft Co., The, Troy, Ohio, spare parts, 35 ea., $86,081.

Westinghouse Electric Corp., 32 N. Main St., Dayton, socket, $37,342.

Weston Electrical Inst. Corp., Newark, N. J., instrument maintenance parts, $58,507; ammeters, $57,317.

ACF-Brill Co., 62nd & Woodland Ave., Philadelphia, bomb sling, 1,000 ea., $43,750.

ACF-Brill Motors Co., Hall-Scott div., Berkeley, Calif., modification kit, $58,547.

Aeromotive Equipment Corp., 1632 Central St., Kansas City, Mo., antenna group, 600 ea., $40,980.

Aeroquip Corp., 300 S. East Ave., Jackson, Mich., fitting assembly, 102,525 ea., $162,561.

Aircraft Hardware Mfg. Co., 810 Edgewater Rd., New York, bolts, 821,720 ea., $72,349; bushing, nipple, elbow, 60,450 ea., $32,209; aircraft bolts, 182,100 ea., 62,297.

Alco-Deree Co., 4300 N. California Ave., Chicago, structural steel angle, 641 tons, $108,169.

Allison div., GMC, Indianapolis, engines and spare parts, 300 ea., $3,000,000.

American Bosch Corp., Springfield, vibrators, 2,479 ea., $56,211.

American Phenolic Corp., 1820 S. 54th Ave., Chicago, connectors, $67,549; $143,494.

American Saw Mill Mach. Co., Main St., Hackettstown, N. J. stand., assembly, 64 ea., $76,096.

American Seating Co., 1776 Broadway, New York, chair, 35,462 ea., $300,363.

American Steel Co., 408 Park Building, Pittsburgh, pins, 13,560,000 ea. $34,171.

W. A. Apple Textile Mfg., Inc., 217 Washington Ave., Dayton, container assy., 2,800 ea., $72,502.

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, sawing machines, 24 ea., $60,292.

Auto-Lite Battery Corp., Toledo, batteries, 1,000 ea. $91,422.

Aviators Clothing Co., Inc., Beacon, N. Y., flying jackets, 28,801 ea., $417,614.

Barnes Mfg. Co., 651 N. Main St., Mansfield, Ohio, oil servicing nozzle, 3,600 ea., $68,040.

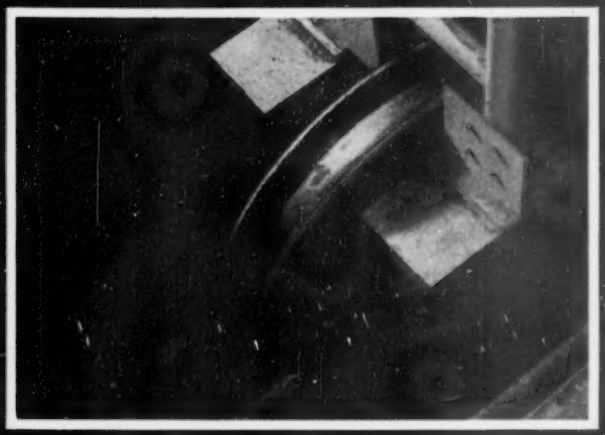
Beech Aircraft Corp., 6600 East Central Ave., Wichita, jettisonable fuel tanks, $8,297,246.

Bendix - Westinghouse Automotive Air Brake Co., 901 Cleveland Rd., Elyria, Ohio, spare parts, $153,788.

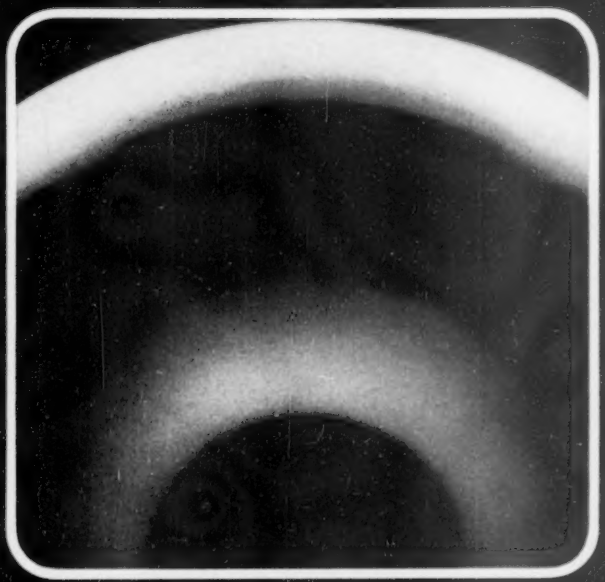
Wm. A. Beterly, Inc., 3 Wood St., Wilkes-Barre, Pa., support strap, 75,000 ea., $252,750.

Carlo Bianchi and Co., Inc., 24 Union St., Framingham, Mass., tiedown, cargo airplane type, 40,122 ea., $832,130.

Boeing Airplane Co. div., Seattle, kits, $1,330,072.



Big loads going up–



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That is why this crane wheel was checked by radiography. It was the one way to prove whether gas pockets or other internal defects might exist to cause a hazard.

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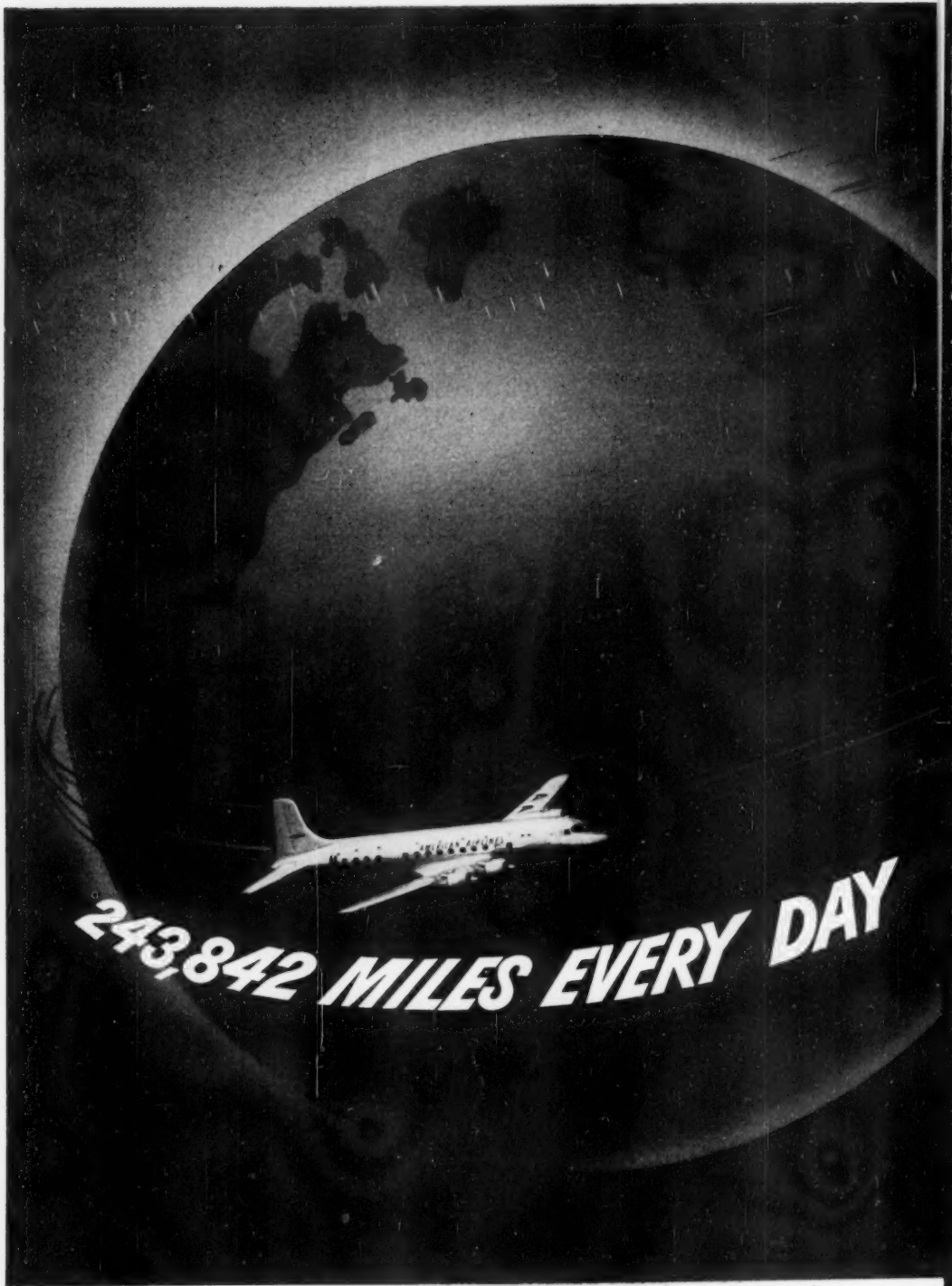
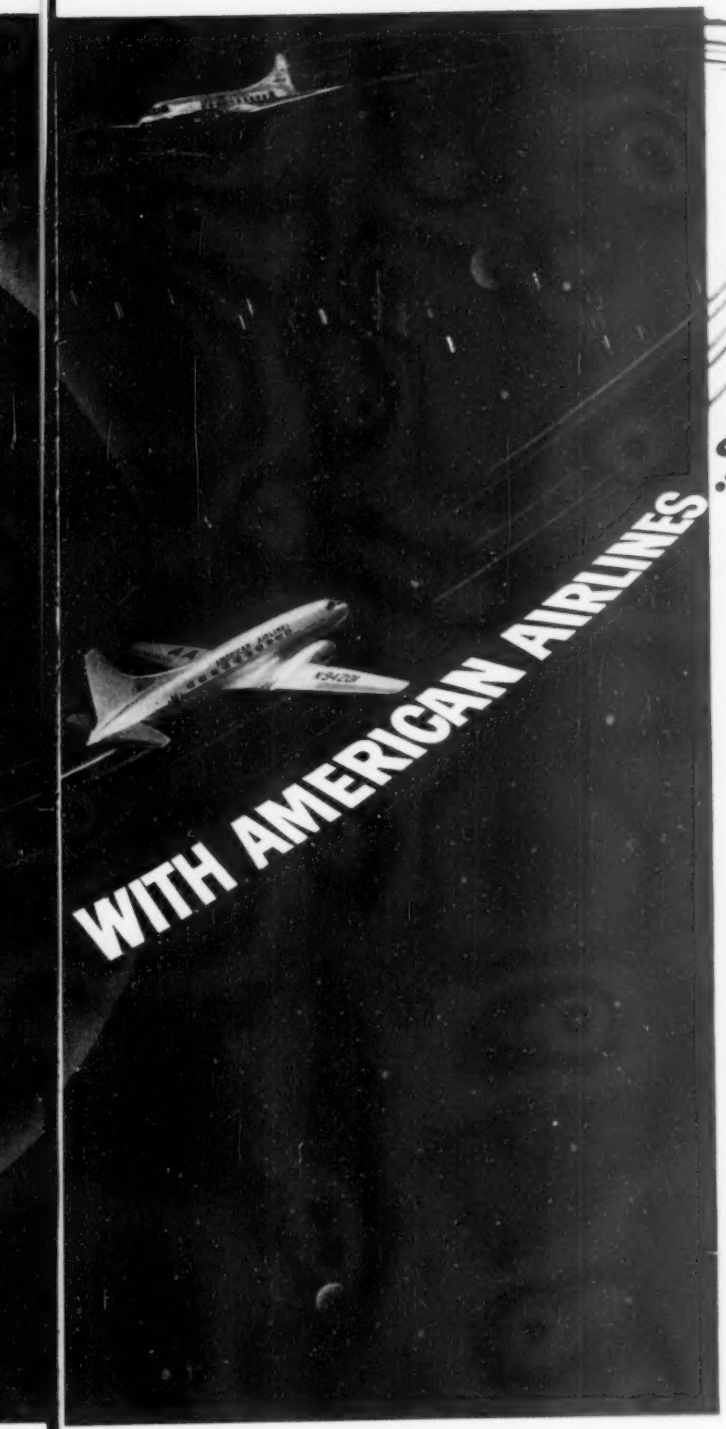

243,842 MILES EVERY DAY



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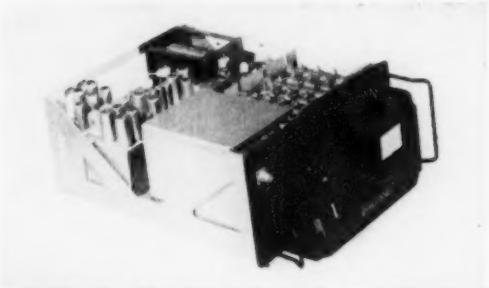
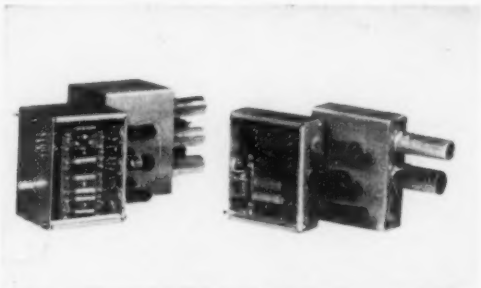


NEW COLLINS 618S HF airborne transceiver with cover off shows clean modular type construction which employs . . .



SMALL PLUGIN ASSEMBLIES like these whose covers slip off to expose internal workings for easy maintenance.

Novel Design Featured in HF Transceiver

It is for use with either voice or phone; has automatic tuning; and provisions for future modifications.

By Philip Klass

Collins Radio has announced a new 100-watt high-frequency airborne transceiver which can be operated on either phone or CW in the 2-to-25-mc. band. The new 618S equipment provides up to 144 crystal-controlled channels, with a minimum of 129 independent frequencies.

▶**Interesting Features**—An unique feature of the new airborne transceiver is its use of small servo systems to automatically resonate (tune) the exciter, power amplifier, and antenna matching circuits. When the pilot selects the desired frequency, the transceiver tunes itself to the selected crystal. New frequencies can be set up quickly merely by plugging in the proper crystal. No further adjustments are required.

Another novel feature is the use throughout the transceiver of plugin type subassemblies which offer attractive maintenance advantages.

In addition, Collins looks to the future when this type construction may permit the use of identical subassemblies in several types of equipment. For example, Collins says, a servo or audio amplifier might find use in both HF and VHF equipment. Collins claims the 618S is also the first airborne transceiver to use mechanical type filters.

The complete airborne equipment includes the type 618S-1 transmitter-receiver, weighing 60 lb., an 180L-2 automatic antenna matching network, weighing 20 lb. which matches the 52-ohm output of the transmitter to a 50-to-100-ft. aircraft antenna, and a small power supply weighing 20 lb.

▶**Transmitter Highlights**—Collins lists the following characteristics of the transmitter portion of the 618S:

- 100 watts power throughout frequency range and up to 35,000 ft.
- A-3 type emission on phone; A-1 type emission on CW.
- Quartz crystal (CR-18U) frequency control.
- 144 channels with minimum of 128 independent frequencies.
- Distortion less than 5% at 90% modulation.
- Speech clipping up to 15 db.
- Frequency response flat within ± 2 db. from 300 to 3,500 cps; rapid attenuation above and below this range
- Frequency stability with ± 0.007% under service conditions.
- Channeling time of 8 sec. maximum.

▶**Receiver Highlights**—Here's what Collins says about the receiver portion of the 618S:

- 3-microvolt sensitivity for a 6-db. signal-plus-noise to noise ratio (with standard test signal modulated 30% at 1,000 cps.).
- Automatic volume control providing maximum variation of 3 db. for signal variation of 5 to 100,000 microvolts.
- 6 db. selectivity at 6-kc. bandwidth; 60 db. selectivity at 15-kc. bandwidth.
- 500-milliwatt power output into 300-ohm load.
- 10% maximum distortion.
- Frequency response flat within ± 3 db. between 300 and 3,500 cps.
- Series-type carrier-biased peak noise limiter.

▶**Eye to the Future**—Collins has designed its transceiver with provisions for replacing the 144 crystal-controlled oscillator unit with a stabilized master oscillator (SMO). Collins says the SMO, now under design, will fit into the space now occupied by the crystal oscillator and adjacent space now vacant, and will give crystal-controlled stability without requiring individual crystals for each channel.

Collins has also designed the 618S with the view to future use of single-sideband transmission which came under discussion during the recent Copenhagen conference of the International Air Transport Assn. (AVIATION WEEK June 23, p. 54). Collins says that the low frequency (250 kc.) injection frequently used could be replaced by one which is modulated for single-sideband transmission or for frequency shift keying (FSK) teletype operation.

The 618S requires approximately 770 watts of 28 v. d.c. power plus approximately 115 watts of 115 v. a.c., most of which can be from a wide-frequency (320 to 1,000 cps.) supply.

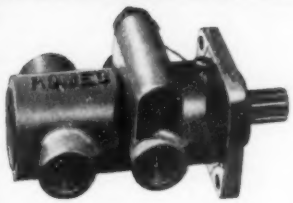
Hi-Temp Coils

Two lines of high temperature electrical coils, one capable of operation at 300F, the other at 450-650F, for use in solenoids or small motors are available from Douglas-Randall, Inc. They are available as random-wound or interleaved coils, on either round or rectangular bobbins, built to the user's specifications. The 450-650F coils are wound in wire sizes that range from 30 through 44.

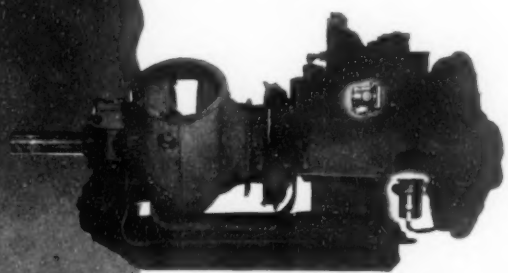
Douglas-Randall, Inc.; 102 High St., Westerly, R. I.

Selected

for the BOEING TURBINE ENGINE



LEAR-ROMEC Model RD-7150 Pressure & Scavenge pump. Rotary vane type, with non-pulsating bore and through-type blades.



BOEING MODEL #502 SERIES GAS TURBINE ENGINE, serving on land, at sea, and in the air. Illustration shows installation of LEAR-ROMEC Model RD-7150 lubricating and scavenging pump (lower right) and LEAR-ROMEC Model RD-7990 engine-driven fuel pump (upper right).

LEAR-ROMEC lubricating and scavenging pumps have been selected for the Boeing Model #502 Gas Turbine Engines. The Model RD-7150 two-pump unit, now used on these versatile turbine engines, supplies 3.5 gallons per minute of oil at 150 psi for lubricating gas turbine or other engines. Designed for 5000 hours of trouble-free operation, the elements of this pump are service proven with over ten years of pumping of aircraft fuel, oil, and ethylene glycol.

LEAR-ROMEC pumps are selected for their efficiency and versatility in lubricating and fuel systems of aircraft and industrial turbine engines, and reciprocating engines. Where production model pumps are not suitable, Lear-Romec designs and manufactures the proper pump to customers' specifications.

Complete details on LEAR-ROMEC pumps available from . . .

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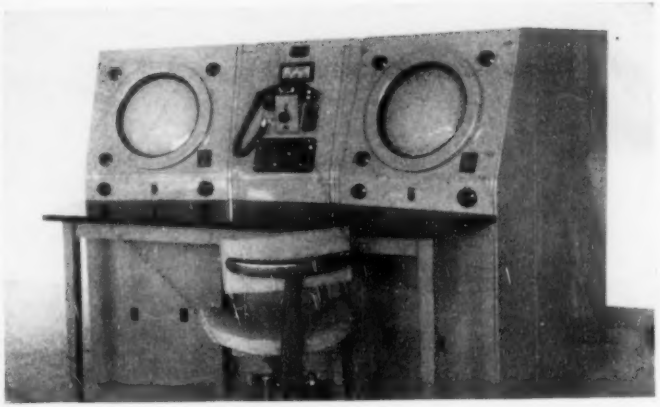


British Low-Cost Approach Radar

(McGraw-Hill World News)

London—A British firm is going into pilot production on a relatively inexpensive airport approach radar for use in low-density airports which can't justify the use of complete surveillance and approach radars. The set is manufactured by A. C. Cossor, Ltd., London.

The Cossor radar provides azimuth but no elevation information on approach aircraft. It has been successfully tested for several months at Farnborough airport. The set enables the ground operator to give range and azimuth information to approaching aircraft; the pilot must rely upon his altimeter to maintain proper altitude and vertical descent. However Cossor is reported to be adapting the radar to permit it to also provide elevation information.

▶ **Resembles Half a PAR**—The present design is comparable to the azimuth portion of the precision approach radars (PAR) used in the U. S. The British radar operates on a 3.2-cm. wavelength (X-band), with a peak power of 40 kw. and an azimuth beam width (between half-power points) of 0.7 deg. It is said to be capable of picking up large aircraft at 15-mi. range; smaller planes at 10 miles. PARs operate on X-band; have a peak power of about 40 kw.; beam width is about 0.8 deg.; range is limited to 10 miles because longer ranges are handled by surveillance radar used with PAR.)

▶ **Operator's Console**—One, two, or more 15-in. cathode ray tube plan position indicators (PPIs) can be mounted on the operator's console. When two PPIs are used, one is adjusted for maximum range scale (15 miles); the other for close-in use (4-5 miles).

The radar antenna, a 12x3-ft. parabolic reflector, scans at 20 rpm. The operator can adjust its elevation tilt between the horizontal and 12 deg. up-elevation. During an approach, the antenna tilt is reduced as the aircraft approaches the airport and loses altitude. This results in losing contact with higher flying aircraft in the area which limits the radar in its present form to light-density airports.

▶ **Radar Data**—Technical highlights of the British radar are:

- **Vertical beam width:** 3½ deg. between half-power points.
- **Pulse width:** 0.1 microseconds.
- **Pulse rep. rate:** 1,500 per second.
- **Off-set display:** Up to one radius in any direction.
- **Time base ranges:** Three, 0.6 to 20 miles, independently set for each indicator.
- **Range markers:** Variable, independently set on each indicator.
- **Total weight:** Approximately 2,000 lb. including antenna and power unit.

Precision Resistors

A complete line of precision high-temperature resistors designed to operate between —55C and 125C, and built to MIL-R93 specifications, are now available from Instrument Resistors Co. The total percentage resistance change in this temperature range is under 0.2%, the manufacturer says.

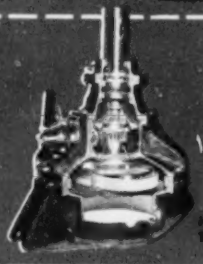
Tests have shown the resistors will function with dependability and long life at ambient temperatures in excess of 235C, the manufacturer states. The units are available in resistances up to 25,000 ohms, and in power ratings up to 6 watts. Standard tolerances are one percent, with special resistors available with 0.1% tolerance.

Instrument Resistors Co., Commerce Ave., Union, N. J.

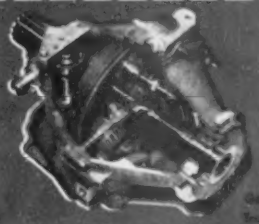
IN-FLIGHT EQUIPMENT

ACCESSORY DRIVES

SPECIAL GEAR DRIVES



Helicopter Transmission



Gas Turbine Transmission

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Precision Gears for Every Requirement

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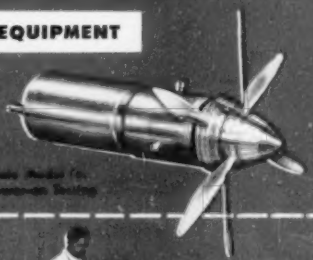
Rotary Cam-to-Gear Actuator

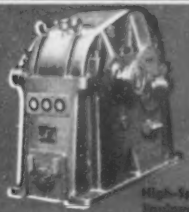
Gun-Powered Actuator

GROUND EQUIPMENT

TESTING

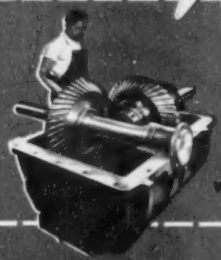


Static Model Co-Ordination Testing



High-Speed Test Equipment

WIND TUNNEL EQUIPMENT



Wind Tunnel Drives

Wind Tunnel Thrust Actuators

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For more than 18 years, Eclipse-Pioneer has been a leader in the development and production of high precision synchros for use in automatic control circuits of aircraft, marine and other industrial applications. Today, thanks to this long experience and specialization, Eclipse-Pioneer has available a complete line of standard (1.431" dia. X 1.631" lg.) and Pygmy (0.937" dia. X 1.278" lg.) Autosyn synchros of unmatched precision. Furthermore, current production quantities and techniques have reduced cost to a new low. For either present or future requirements, it will pay you to investigate Eclipse-Pioneer high precision at the new low cost.

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	Type Number	Input Voltage Nominal Excitation	Input Current Milliamperes	Input Power Watts	Input Impedance Ohms	Stator Output Voltage Line to Line	Rotor Resistance (DC) Ohms	Stator Resistance (DC) Ohms	Maximum Error Spread Minutes
Transmitters	AY201-1	26V, 400~, 1 ph.	225	1.25	25+j115	11.8	9.5	3.5	15
	AY201-4	26V, 400~, 1 ph.	100	0.45	45+j225	11.8	16.0	6.7	20
Receivers	AY201-2	26V, 400~, 1 ph.	100	0.45	45+j225	11.8	16.0	6.7	45
Control Transformers	AY201-3	From Trans. Autosyn	Dependent Upon Circuit Design				42.0	10.8	15
	AY201-5	From Trans. Autosyn	Dependent Upon Circuit Design				250.0	63.0	15
Resolvers	AY221-3	26V, 400~, 1 ph.	60	0.35	108+j425	11.8	53.0	12.5	20
	AY241-5	1V, 30~, 1 ph.	3.7	—	240+j130	0.34	239.0	180.0	40
Differentials	AY231-3	From Trans. Autosyn	Dependent Upon Circuit Design				14.0	10.8	20

**Also includes High Frequency Resolvers designed for use up to 100KC (AY251-24)

AY-500 (PYGMY) SERIES

Transmitters	AY503-4	26V, 400~, 1 ph.	235	2.2	45+j100	11.8	25.0	10.5	24
Receivers	AY503-2	26V, 400~, 1 ph.	235	2.2	45+j100	11.8	23.0	10.5	90
Control Transformers	AY503-3	From Trans. Autosyn	Dependent Upon Circuit Design				170.0	45.0	24
	AY503-5	From Trans. Autosyn	Dependent Upon Circuit Design				550.0	188.0	30
Resolvers	AY523-3	26V, 400~, 1 ph.	45	0.5	290+j490	11.8	210.0	42.0	30
	AY543-5	26V, 400~, 1 ph.	9	0.1	900+j2200	11.8	560.0	165.0	30
Differentials	AY533-3	From Trans. Autosyn	Dependent Upon Circuit Design				45.0	93.0	30

For detailed information, write to Dept. H.

ECLIPSE-PIONEER DIVISION of Bendix

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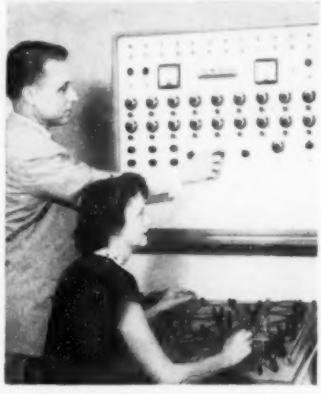
FILTER CENTER

▶ **RCA May Develop New Radar**—A major domestic airline is negotiating with Radio Corporation of America for the development of a new transport radar to be lighter and less complex than the AN/APS-42 which RCA now produces for the military. RCA is unable to sell APS-42s to the airlines because of security restrictions.

▶ **Bright Display Radar Soon**—A DuMont-designed bright-display equipment which would permit GCA operators to view their radar scopes under relatively high intensity light conditions is slated for November delivery to the Civil Aeronautics Administration for evaluation. Developed under contract to the Air Navigation Development Board, the first DuMont equipment is designed for use with ASR-2 surveillance radar. Another equipment for use with PAR-1 approach radar is scheduled for delivery in late 1953. Both will use the Graphechon tube developed several years ago by Radio Corp. of America.

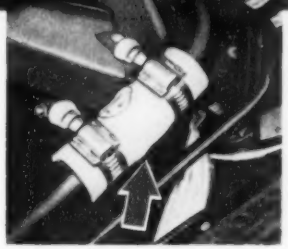
▶ **New Hi-I Intercom.**—New high-intelligibility intercommunications system which RCA is building for Air Force planes should greatly improve in-flight crew communications. USAF gave RCA free rein to design complete system without regard to using existing components. Result is reported to give quiet-room quality of intelligibility.—**PK**



DIFFERENTIAL ANALYZER

New L3 model of Goodyear Aircraft Corp.'s GEDA electronic differential analyzer is easy on the eye, the operator, and the maintenance man. GEDA finds use in aircraft and missile stability studies. It may be operated entirely from the front, either sitting or standing. Plugin units and swing-out panels simplify maintenance.

G-E SILICONE RUBBER PAYS OFF



G-E silicone ducting connects tubing carrying hot air to cabins and de-icing systems in the F-86 Sabre Jet. Its temperature resistance (–85 to 500 F) provides a high safety factor. Connection shown made by Aeroduct, Inc., for North American Aviation, Inc., from G-E silicone rubber SS-15.

IN JET PLANE APPLICATIONS

The amazing ability of General Electric silicone rubber to withstand extremes of temperature pays off by making possible long-lasting jet plane parts with a safety factor *far greater than any ordinary rubber can provide.*

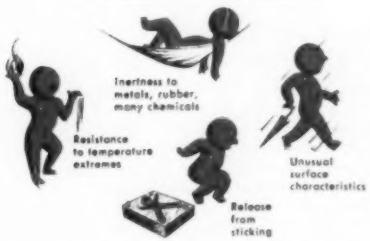
Capable of withstanding 450 F for long periods, G-E silicone rubber is ideal for fire-wall seals and ignition cable shields in jet engines, as well as for hot-air ducting. And because it stays flexible at –85 F, it provides a reliable sealing material for the doors and windows of high-altitude aircraft.

Typical industrial applications for G-E silicone rubber include spark plug boots and ignition sleeves that stand up indefinitely under high engine heat and deteriorating oils. Seals, gaskets, washers and bushings made of G-E silicone rubber offer unusual temperature resistance, chemical inertness and excellent insulating and dielectric properties.

Where can you use G-E silicone rubber?

Have *you* investigated G-E silicone rubber *lately?* It's *three times* as strong and costs *much less* than earlier varieties. Send coupon today for a new booklet telling how *you* may take advantage of its unusual properties in *your* business.

THE FOUR BASIC PROPERTIES OF G-E SILICONES


Inertness to metals, rubber, many chemicals
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Unusual surface characteristics
Release from sticking

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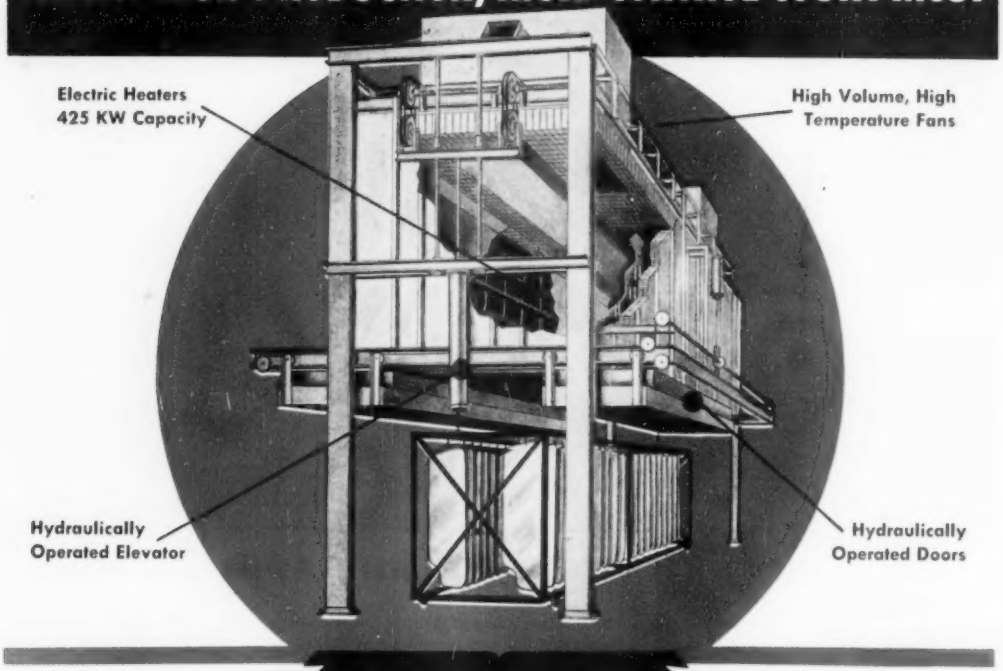
WHERE HIGH PRODUCTION, RIGID CONTROL COUNT MOST



DESPATCH

Bottom Entry *Quick Quench*

ALUMINUM HEAT TREATING FURNACE

Fills the Need Best

A large Eastern Aircraft plant is meeting high production schedules and rigid Government aircraft specifications day after day with this Despatch bottom entry, quick quench furnace on the solution heat treating of aluminum and aluminum alloy shapes.

Operating range of the furnace is from 212° F. to 1250° F. with a uniformity of plus or minus 5° F. Heating equipment is of sufficient capacity to bring a 750 lb. aluminum work load, plus a 1000 lb. steel rack, both at room temperature, to 920° F. in 20 minutes when furnace is loaded at operating temperature.

Hydraulically operated furnace doors and elevator are interlocked and automatically controlled from a push button station. They provide for rapid movement of the load to the quench tank. Speed of quench is considerably less than 10 seconds.

Furnace is heated with 425 KW capacity nichrome, rod type electric heaters mounted along each side wall and protected by suitable radiation shields. Two high volume, high temperature air circulating fans assure rapid transfer of heat to parts being processed.

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Transocean: 'Anything, Anywhere' Airline

- **Many faceted firm finds its diversity pays off.**
- **Not satisfied it seeks more new ventures.**

By George L. Christian

Oakland, Calif.—Transocean Air Lines' reputation as the most many-sided airline in the world seems secure. The carrier's interests within and without aviation include maintenance and overhaul activities, a flying school, a gas station, industrial chemical sales, automobile distributorship, a broom company, and many others (AVIATION WEEK Oct. 22, 1951, p.66). Its motto could well be "Anything, Anywhere."

Just to name some of Transocean's 16 subsidiaries is to indicate its varied operations: Aircraft Engineering & Maintenance Co. (Aemco), Oakland Aircraft Engine Service, Inc., Taloa Academy of Aeronautics, Air Djibouti, Western Sky Industries, Talchem, Taloa Trading Corp., Taloa Motors, Holly Equipment Co., Arrowhead Broom Co.

▶ **Big Baby**—Aemco, Transocean's biggest subsidiary, recently landed a husky $7.5-million Air Materiel Command contract to maintain and overhaul heavy military transports. Effective July 1, the carrier started cyclic maintenance and overhaul (plus modification where required) of Military Air Transport Service and Far East Air Force transports, including aircraft operating in the Korean Airlift and war theater.

Aemco has overhauled 462 heavy aircraft since it started in 1948 on Berlin Airlift planes. Expenditures of $25 million have been chalked up since then. Current payroll covers 1,400 employes working on two shifts.

Using production-line techniques—specialized operations performed at specific stations—Aemco has pulled a cyclic overhaul on a MATS C-54 in what is believed to be the record time of 21 days. Average is 28-30 working days, with the planes staying in the shop about 40 days.

George Anderson, Aemco supervisor, told AVIATION WEEK that his organization can pull an 8,000-hr. inspection in the same time span.

▶ **What's New**—Transocean was one of the first airlines to fill the main hydraulic system of one of its aircraft (a DC-4) with H-2, non-flammable hydraulic fluid made by R. M. Hollingshead Corp.

The carrier was enthusiastic about the results, but trouble with valves in the autopilots was traced to the fluid, and the company has discontinued its use for the time being.

Another recent test installation of Taloa's is the Hytrol anti-skid unit on a DC-4 for evaluation.

▶ **Large Activity**—Transocean employs about 3,500, spread out from the States to such farflung outposts as Djibouti, Wake Island, Nairobi, Teheran and Rangoon.

The company operates such diverse activities as flying PBYs for the U.S. Department of the Interior among the Trust Territory Islands in mid-Pacific. It operates weekly flights between islands of the Marianas, Carolines and Marshalls. Martin 2-0-2s on Japan Air Lines routes are flown by Transocean crews.

Transocean, through its Air Activities division, has contracted with the Technical Cooperative Administration of the Department of State to provide dusting and spraying services in such localities as Pakistan, Iran, Iraq, Syria, Egypt, Afghanistan, India and Libya.

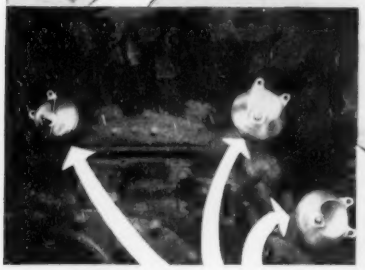
As soon as a new plant is completed, Taloa's Holly Equipment division will start turning out $8-million worth of center sections for the Douglas AD-5 Skyraider.

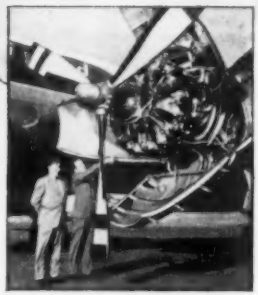
Taloa Trading Co., in plush Rockefeller Center offices, trades in foreign

TRANSOCEAN AIR LINES main base at Oakland Airport takes a lot of space.

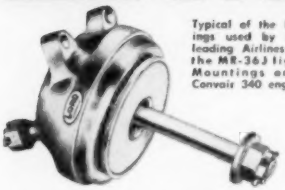
MATS C-54 OVERHAUL accounts for a sizable portion of Transocean's income.

44 LEADING AIRLINES
INCREASE PAYLOAD
By Using LORD Mountings





Typical of the Lord Mountings used by the world's leading Airlines today, are the MR-363 lightweight Mountings on the new Convair 340 engines.



Pratt-Whitney R-2800 CB-16 Engines pack the power—and these new lightweight, low-cost Lord Mountings increase the payload approximately 10 lb. per engine . . . protect the air-frame from vibration . . . give passengers a smoother ride.

Lord Vibration Control Mountings are increasing payloads, protecting airframes, instruments and accessory equipment . . . adding to the comfort of passengers on 44 of the World's Leading Airlines. Why? Because Lord Engineering experience and manufacturing capabilities are providing light weight, low-cost mountings which contribute much to profitable airline operation. Lord engineering capabilities are being used to advantage by design engineers throughout world industry in their battle to isolate vibration and shock in a wide diversity of machines. Consult with Lord Engineers even before design takes shape on the board . . . and in perfecting machines already operating . . . You will profit.

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PRospect 7996

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238 Lafayette Street
MIchigan 8871

DETROIT 2, MICHIGAN
7310 Woodward Ave.
TRinity 5-8239

NEW YORK 16, NEW YORK
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PHILADELPHIA 7, PENNSYLVANIA
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LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER

HEADQUARTERS FOR VIBRATION CONTROL

goods collected at many of the Transocean's world-wide bases.

Talchem division is currently negotiating contracts with major aircraft manufacturers. The division will purchase and sell certain chemicals used in aircraft maintenance and overhaul.

Taloa Printing Co. runs off the company's manuals and other printing requirements. The modern shop, with facilities for lithographing, multilithing, camera work, etc., also does considerable outside business.

The airline (or its subsidiaries) has done such unrelated jobs as training pilots for the Indonesian government, operating long-haul and bush flying for a Navy Alaskan oil exploration, lugging 90,000 lb. of gold from Tokyo to New York for Thailand, ferrying 150 C-46s from the U.S. to Shanghai's Kiangwan Airport (having previously prepared the planes for the long overwater haul). It currently operates 35-40 trips a month from Travis AFB, Calif., to Tokyo with seven DC-4s it owns.

▶ **Plane Variety**—Not only are Transocean's activities diverse, so is its fleet of aircraft. It owns a total of eight DC-4s (two more are leased from the government), three 2-0-2s, two DC-3s, seven C-46s, five Noorduyn Norsemen, one Grumman Widgeon and four smaller bush-type aircraft. The company leases four PBY-5As for the Trust Territory operation.

Training planes owned by the company are two twin Beech AT-11s and three Twin Cessnas. Other small aircraft include AT-6s, PT-13s, Aeroncas, and single-engine Cessnas. Total fleet numbers 110 planes.

▶ **H-2 Research**—Taloa's experiments with H-2 were prompted by a cockpit hydraulic leak, A. J. Macedo, chief engineer, told AVIATION WEEK.

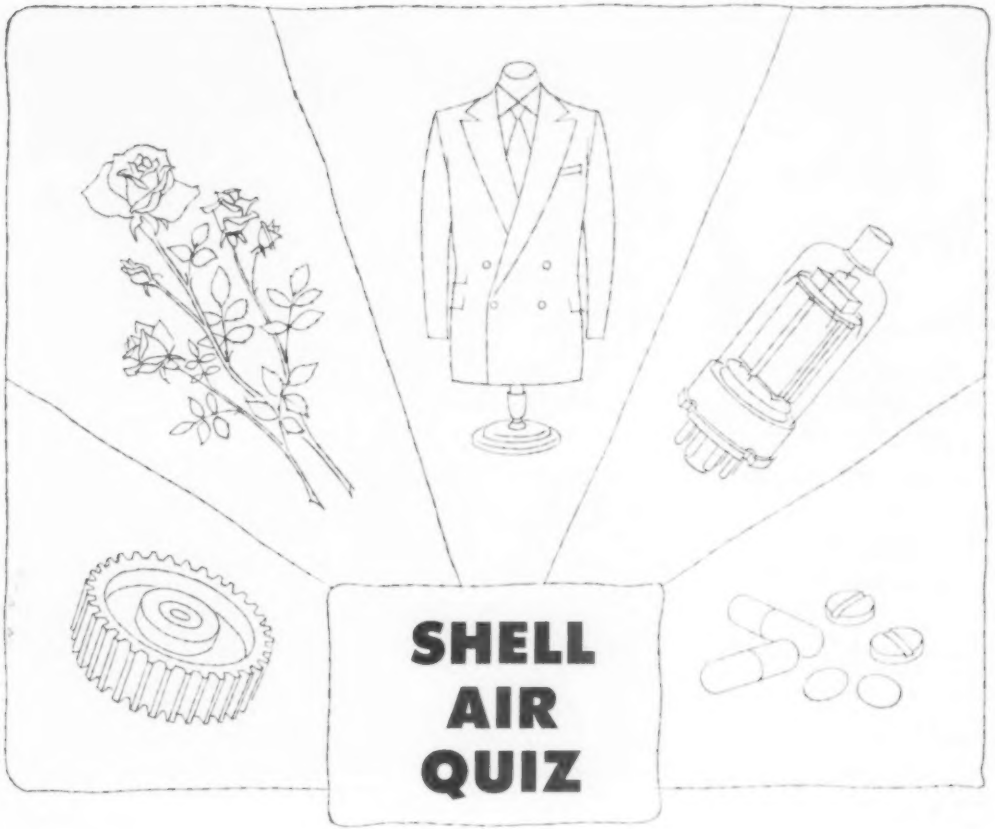
A pinhole leak at the windshield wiper rapidly filled the flight compartment with hydraulic mist. The pilot, recognizing the potential danger of such a situation, requested that company officials try a non-flammable fluid. H-2 was chosen, primarily because its use did not necessitate a wholesale hydraulic system seal change.

Macedo cited these results with H-2:

• **Fire hazard reduction.** A leak developed in the hydraulic pressure line leading from pump to firewall of one of Transocean's DC-4s. The accessory section was liberally sprayed with H-2, but no fire occurred. Normally, such a condition would have been a serious fire hazard.

• **Internal leakage reduction.** Macedo said that his experience with H-2 indicated that the fluid reduced internal leakage in DC-4 hydraulic systems.

He said that in the 2,742 hours that H-2 had been used, it had given no trouble in the main hydraulic system.



SHELL AIR QUIZ

Question:

From these five leading types of air freight shipment, can you pick the top tonnage classification?

( ) Electronic Parts ( ) Machine Parts
( ) Flowers ( ) Garments ( ) Biologicals

Answer:

In order of tonnage, the actual ranking is: (1) Garments (2) Machine Parts (3) Electronic Parts (4) Flowers (5) Biologicals

Question:

Which Aviation Fuel in the U. S. A. today
flies the most air freight?
. . . the most passengers?
. . . the most air mail?

Answer:

SHELL AVIATION FUEL

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Excellent opportunities are offered for experienced engineers and analysts with airplane and guided missile flight test and flight test instrumentation background.

Outstanding opportunities are available on a long-range development program on basic guided missile work.

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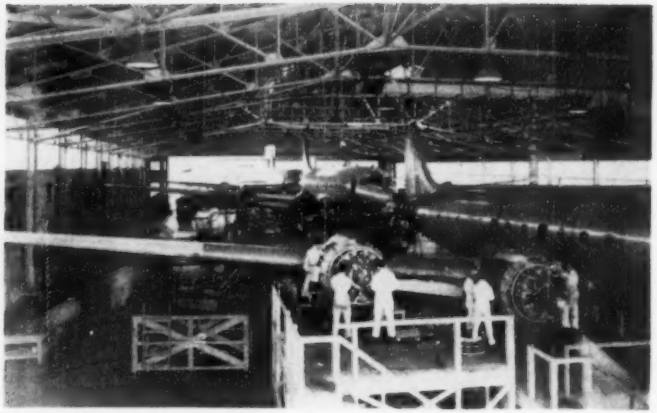
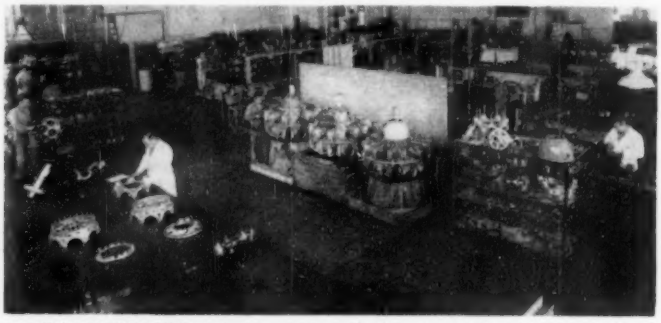


C-54 AIRFRAME OVERHAUL is handled by Aemco subsidiary at Oakland Airport.



ENGINE OVERHAULS are done by another subsidiary, Aircraft Engine Service, Oakland.

No leaks had developed, nor was there appreciable corrosion. Brakes worked well and the seals did not leak. Pump operation did not vary from action given with AN-O-366A fluid. When the pump was removed and disassembled after the 2,700-hr. run, inspection showed that wear on moving parts was "nil." Minor surface corrosion was observed at the bore of the aluminum housing.

- **Paint removal was slight.**
- **Duration of hydraulic system cycle** was increased from 3 to 5 min.

► **Autopilot Trouble**—Although Transocean's H-2 tests were discontinued because of trouble with the Sperry A-3 and A-3A autopilots, Macedo expects to go back to the fluid when electronic autopilots are installed.

The autopilot troubles started in the leather seals of the servos. Seals swelled, causing controls to get stiff and sticky. New, differently treated seals, supplied by Houghton, solved the swelling problem. The new seals were somewhat stiff at first, but loosened up with service.

No sooner were the servo problems licked, however, when oil balance valves acted up, causing hunting and overcontrolling. So the H-2 evaluation was discontinued.

► **Efficient Tank Work**—Aemco does a lot of integral fuel tank stripping and resealing, primarily on C-54s. Because of volume of work at hand, the organization devoted considerable time and thought to developing the best methods to perform this messy operation.

Here is its method, using Products Research compounds:

Stripping is by the fill-and-drain system, using PR-37 solution. At least two, sometimes three and four soaks are necessary to clean out a tank, which is then washed down with high-pressure warm water. Dwell period is 24 hr.

After washing, tanks are hand-cleaned to remove any loose ends and tank is swabbed down with ethyl acetate. All steel parts are coated with PR-611 as protection against corrosion.

Sealing operation starts with squirting PR-1201 injection and void filler compound behind all gussets, angles and inaccessible areas with an injection gun.

Then the PR-1201B1 brushing compound is brush-coated on all areas to

ENGINEERS-

Here is North American's Challenge To You

Frankly, working at North American requires hard thinking and plenty of vision. Because North American always works in the future. Yet, if you are interested in advanced thinking, if you'd like to work on the planes that will make tomorrow's aviation history, you'll like working at North American. North American offers these extra benefits, too.

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Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance including family plan • Sick leave time off • Transportation and moving allowances • Employees Credit Union • Educational refund program • Low-cost group health (including family) and accident and life insurance • A company 24 years young.

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*Snap-on BRINGS YOU THE NEW VARI-HOT Electric Soldering Iron

2 Models $7.75 Each

2-Speed Element Reaches Soldering Heat In 40 Seconds

This 110-115 volt AC-DC iron goes to work FAST! Pressing the button shoots a booster charge of 100 watts within the tip—brings it to soldering temperature in just 40 seconds! Then, only 25 watts maintain normal tip temperature comparable to conventional irons drawing 100 watts. For heavy soldering jobs full current is always available by pressing the button.

A 28-32 volt AC-DC model is available for aviation use off the airplane power supply, it draws 3.6 amps in high heat and 0.9 amp in idling heat.

The Vari-Hot iron is *light*... only 10 ounces—a boon in continuous soldering operations! Adjustable rest on shaft permits laying iron down with no danger of burning surfaces or starting a fire. Shockproof Durez handle. Tapered chisel type tip plated with "Vanderloy" provides extreme durability to tip. Other type interchangeable tips are available. Write for literature and catalogs.

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(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Vic Larsen has packed a lot of living into half a century.

Beneath his philosophies and his pleasant Scandinavian accent, you can sense the wanderlust, curiosity, ambition and determination that have molded this kindly white-haired man.

As head of Whittaker's Hydraulic Design Group, Vic is absorbed with the challenging mechanical problems of controlling immense fluid pressures in tight packages.

When Field Engineering sends in specific customer requirements for a valve, Joe Globig, chief engineer, sends them to Larsen for analysis, basic design and preliminary sketches. Vic turns them out in from three days to four weeks—seldom longer.

Chief Designer Vic Larsen

Vic's four-man department is credited with designing some 150 hydraulic valves so far this year. Three-quarters of them have been distinctly new units designed as customer specialties, the remainder modifications of existing valves. Many of the special designs have become standard production items through adoption by concerns other than the original customer.

But back to Vic as a personality.

Born in Copenhagen, Denmark, the son of fishing folk, he took to the sea as a youngster. He saw service on brigs, barkentines, schooners and square riggers before he signed on his first steamship, an able bodied seaman at the age of 16. And there began the interest in mechanics that has shaped his life.

At 22 he found himself in the United States, and he tells of his subsequent decision quite simply:

"I liked it here better than anywhere else, so I decided to stay."

In succeeding years he worked as a farm hand, truck driver, automobile and washing machine mechanic, shop man, Diesel expert, draftsman, inventer, consulting engineer and aeronautical designer.

And during these years he was employed by Ingersoll-Rand, Easton Engineering, Richardson Scale, Fokker Aircraft, New Standard Aircraft, Commercial Aircraft, and Sikorsky, before forming his own concern, the Colgate-Larsen Co., to build amphibian aircraft. Following World War II, when he was a design engineer with Lockheed, he joined Saval and Whittaker when the two companies merged.

How could a man without formal education achieve such a record?

Vic's secret was driving ambition and an eagerness to study. He's still studying, "filling in the blind spots," he calls it, and hopes to be reasonably well posted by the time he's 80!

He taught himself English first, then plunged into every subject that absorbed him – math, literature, politics, mechanics, drafting, engineering, physics, geology. He plays excellent (self-taught) classical piano, and for the past five years has used much of his leisure to study atomic energy.

Dogged during the war years by his lack of citizenship, Vic finally went to Cuba and re-entered the United States on the regular Denmark quota. He is now an American citizen.

"I should have done it years before, but I was too busy," he said.

His job with Whittaker is basic hydraulic design without detail work or prototype production. He works on the theory that if it's done right in the first place, it won't come back for fixing.

"The big challenge," he says, "is the increase in complication and the decrease in allowable envelope.

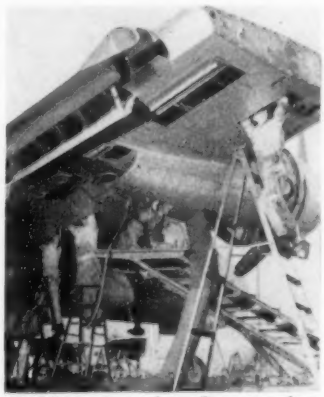
"Customers want more and more, crowded in less and less space . . . efficient control of pressures at 3000 p.s.i. and no more than 1/64 of an inch leeway to work in. It's rough, but we make it."

Vic has great faith in mathematics, but he maintains that you've got to have sort of a sixth sense to tell you what you can or can't do.

But the genial designer with the husky seaman's hands and the scholar's mind takes no personal credit.

"Everybody contributes to the job—including the boy who scrubs up and the girl who brings coffee. How could we do good work in a littered office or on bad coffee?"

TANK STRIPPER dressed and ready for work.



SEALING wing tanks at Transocean base.

be sealed. After this tank is heat-cured for 6 hr.

Next, PR-101, thinned with water to paint thickness, is brushed over all seams, cracks, bolts, etc., and over all PR-1201BT-covered areas. This is cured 4 to 8 hr. at 120F.

Two PR-101 spray treatments follow, each separated by a 4-to-8-hr. drying period.

A spot check follows, with PR-101 used to patch up any blistered areas or places in need of repair. Stringers are sealed by fill-and-drain treatment with PR-611.

Access doors, booster pumps, liquidometers, etc., are sealed with PR-5201K gasket material. And 5201 is used for line repair. Because it will cure under gas, it is quick to use and saves weight—up to 300 lb. per aircraft, according to Aemco estimates.

Aemco figures its method of tank sealing increases individual fuel tank capacities by 20 gal. or more.

► **Around the Shop—**

• Transocean likes the retread job Thompson Tire Co. (San Francisco) is

TURBO-JET ENGINE *Temperature Control* AMPLIFIERS

To assure reliable service, a turbo-jet engine temperature control amplifier must be designed and constructed to provide:

1. Efficient operation in ambient temperatures from minus 65°F. to plus 200°F.
2. Vibration endurance covering a range from 5 to 150 cycles per second.
3. Operation in altitudes up to 60,000 feet through the use of hermetically-sealed components.
4. Center of gravity shock mounting to permit installation right on the turbo-jet engine.

Manning, Maxwell & Moore engineers have evolved a highly successful technique for creating turbo-jet temperature control amplifiers that satisfy all these basic requirements. This technique employs a design principle proved valid in more than four years of intensive research, development and tests devoted exclusively to automatic control systems for jet engines.

We believe our unique design methods and extensive manufacturing and test facilities can help you build better and safer jet aircraft today and in the years ahead. Our engineering counsel is at your service. We invite your inquiry.

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FAST ACTION...
MARTIN P5M-1 MARLIN SUB-SMASHER
A deadly anti-submarine weapon designed to detect surfaced and snorkeling submarines. Once the sub has been located, this big seaplane carries the killing punch in its bomb bays to destroy the enemy raider.

MARTIN MARLIN "CHASES ITS TAIL" WITH A NEW KIND OF RUDDER

Hydro-flaps on the Martin Marlin are underwater rudders and brakes that make possible quick turns and fast maneuvering in restricted waters. The Marlin, as shown, can turn in a radius of about 1-1/2 times wingspan; which is approximately one-third the minimum radius required with engines alone.

Shown above is the Barber-Colman Micropositoner* polarized relay.

BARBER-COLMAN MICROPOSITIONER PROVIDES RAPID ACTION OF HYDRO-FLAPS

The flaps, located on each side of the airplane's hull near the stern, are operated by hydraulic units and may be used separately when turning, or together when braking action is desired. The control system for the hydro-flaps uses Barber-Colman Micropositioners*, one for each flap, which transmit the governing signal to the hydraulic system valve. A transmitting potentiometer is geared to each flap *pedal* at the flight station, and the follow-up potentiometers are geared to the flaps. The result is a pair of self-balancing resistance bridge circuits with polarized relays to provide selective and rapidly variable remote positioning without oscillation or hunting. *This is only one of many specialized Control Systems which have been developed and adapted to military and civilian aircraft using Barber-Colman components.* Write for Aircraft Products Catalog F-4141.

Engineering Sales Offices: **Los Angeles, Seattle, Chicago, Baltimore, New York, Montreal**

BARBER COLMAN

*Reg. U. S. Pat. Off.

BARBER-COLMAN COMPANY

1252 ROCK STREET, ROCKFORD, ILLINOIS

doing on its aircraft tires. Taloa engineers say the tread is good and has eliminated cap cracking between tread grooves. And the tires last longer.

• **MATS planes** come in to the overhaul base in the worst conditions of dirt and grime imaginable. But Cee-Bee brightener turns out a shiny aircraft, no matter how dirty to start with, Aemco says.

• **Aemco average 12 C-54** cyclic maintenance overhauls a month.

• **98% self-sufficiency is** claimed by the overhaul outfit. Only jobs done outside are some specialized plating and oxygen bottle refilling.

• **Big timesaver** in the instrument shop is a liquidometer pre-setting jig. Liquidometers set on this jig require only minor adjustments when installed in planes' fuel tanks.

• **Transocean recently sold** five DC-4s to Saudi Arabia. And it performed a $100,000 conversion job on Ibn Saud's private ship, which is equipped with a throne capable of swivelling through 360 deg. One of the company's engineers designed a special elevator to haul the monarch in and out of the airplane. The compact unit is part of the ship's permanent, airborne equipment.

▶ **"Supplemental Carrier"**—Transocean Air Lines is listed as a large, irregular carrier. It may transport freight anywhere in the world, and passengers anywhere within the U.S. or between the U.S. and its possessions. Taloa likes to think of itself as a "Supplemental Carrier," whose services supplement those of regular certificated carriers.

It sets forth these four categories of service that it would like to provide, if authorized by CAB.

• **Special charter flights** between any two places in the world for groups of people traveling to a given point for a common purpose.

• **Scheduled trans-Pacific coach** service to provide low-cost transportation between the States and Honolulu, Tokyo and Hong Kong.

• **Seasonal summer flights** across the Atlantic when normal trans-Atlantic service is jammed tight.

• **Special flights on a demand basis** anywhere, any time, when certificated carriers' aircraft are filled to capacity.

Transocean officials say these four points would contribute strongly to giving the general public even better worldwide air service than it now gets.

Pan Am Streamlines Spare Parts System

A streamlined spare parts, tool and equipment system has been put into effect by Pan American World Airways' Latin American division.

Developed by the airline's main-

STACKPOLE *Brushes*

HELP PLANES GO HIGHER . . . MORE DEPENDABLY

From altitudes of 30,000 feet—then to 40,000 feet—and now to 50,000 feet and higher, Stackpole has set the pace in aviation generator brush dependability. The same revolutionary principles that enabled Stackpole to increase high-altitude brush life more than 50 to 1 during World War II have steadily been improved, refined and adapted for long-life commutation at higher and still higher altitudes.

As the acknowledged leaders in this essential phase of aviation progress, Stackpole brush engineers offer a wealth of highly specialized "know how" in helping planes probe still farther into the wild blue yonder—*dependably*.

MORE AMPS. PER SQUARE INCH!

Typical of Stackpole high-altitude brush progress is the fact that, on certain applications, current densities of 500 or more amperes per square inch can be carried for short periods on Electro-Graphitic brushes. Normal industrial brush uses seldom call for more than 75 amps. per square inch!

STACKPOLE CARBON COMPANY, St. Marys, Pa.

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The propeller with a brain for personal planes

Aero matic

(Licensed under patents of Everel Propeller Corp.)

tenance superintendent, the method is expected to save several thousands of dollars yearly by reducing inventories of spares kept at various stations. The master line station kit, as it is called, will be able to service any of the six different types of aircraft flown by PanAm.

Spark plugs kept at one station were cut from 1,138 to 240 by the use of the kit. And number of requisitions from line stations is expected to fall sharply too. If a station runs out of a given part, the kit's manual will quickly tell the nearest station where that part is available.

PAA says affiliates Panagra, Panair do Brasil and Avianca have either established similar systems or are considering doing so.

AF Places Order For Arctic Heaters

The Air Force reportedly has placed an order of more than $5 million for portable ground heaters with the Herman Nelson div. of the American Air Filter Co., Inc. The units can be used for pre-heating aircraft engines under Arctic conditions.

Known as BE-400s, they are the latest in the firm's line of military heating units. The order was made after the Air Force paced the units through a long series of tests culminating at the Cold Weather Material Test Group in Alaska.

Power for the units can be either gasoline engine or electric motors, and a switch to either source can be accomplished in a matter of minutes by field personnel, even wearing heavy Arctic mittens.

Easy-to-Erect Work Docks

Two types of pre-fabricated aircraft docks which require only a hammer to assemble or knock down, have been perfected by a British firm, Tiltman Langley Laboratories.

Working on roughly the same principle as a large Erector set, the docks may be made to any size or shape to accommodate any variety of aircraft. One type is a series of mobile stands which may quickly be pushed into position around a plane. Other is a more complicated structure, fixed to the hangar floor. But it also may be erected to wrap around any shape of airplane.

Stands are assembled by the Keylock system. This consists of locking pairs of precision slots together to hold extruded aluminum channels in desired positions. Lock is assured by tapping a tapered pin through a hole in each section. Disassembly is accomplished very easily by knocking out all the key-pins.

SURVIVAL SCREEN

To make sure a careless passerby does not get sucked into the air intake or jet aircraft being run up on the line at the big Tachikawa, Japan, Far East Air Force Base, these protective screens were designed and built. They are equally adaptable to the twin-intake configuration of the F-80 as they are to the nose inlet of the F-86 (shown) and the F-84.

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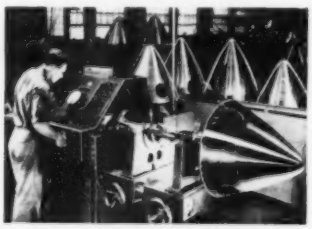
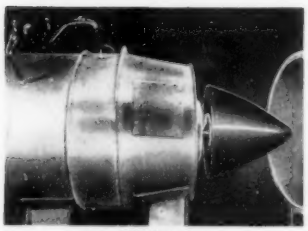


BALANCING
Static
Dynamic



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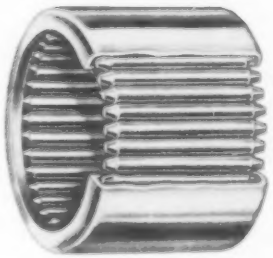
So if high speed is a "must" in your product, ask a Torrington engineer to help you get it, along with other Needle Bearing advantages such as compact size, light weight and ease of assembly.



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*As listed by: C. A. B. "World Directory of Airlines" and international aviation trade press

OFF THE LINE

Latest wrinkle in the fight to keep dust and grit out of jet engine air intakes during landings and takeoffs from metal landing mats is a specially processed duck "carpet." The manufacturer, Textileather Corp., says that it has received a $214,000 order from the Marine Corps for an undisclosed quantity of the carpet. Material is laid under the metal landing mats.

Lockheed Aircraft Service, International advised the recent Scintilla-sponsored Ignition and Engine Analyzer Conference that wing and fuselage wiring built into 1049 Super Constellations for Sperry airborne engine analyzers may also be used for Bendix-Scintilla ignition analyzers.

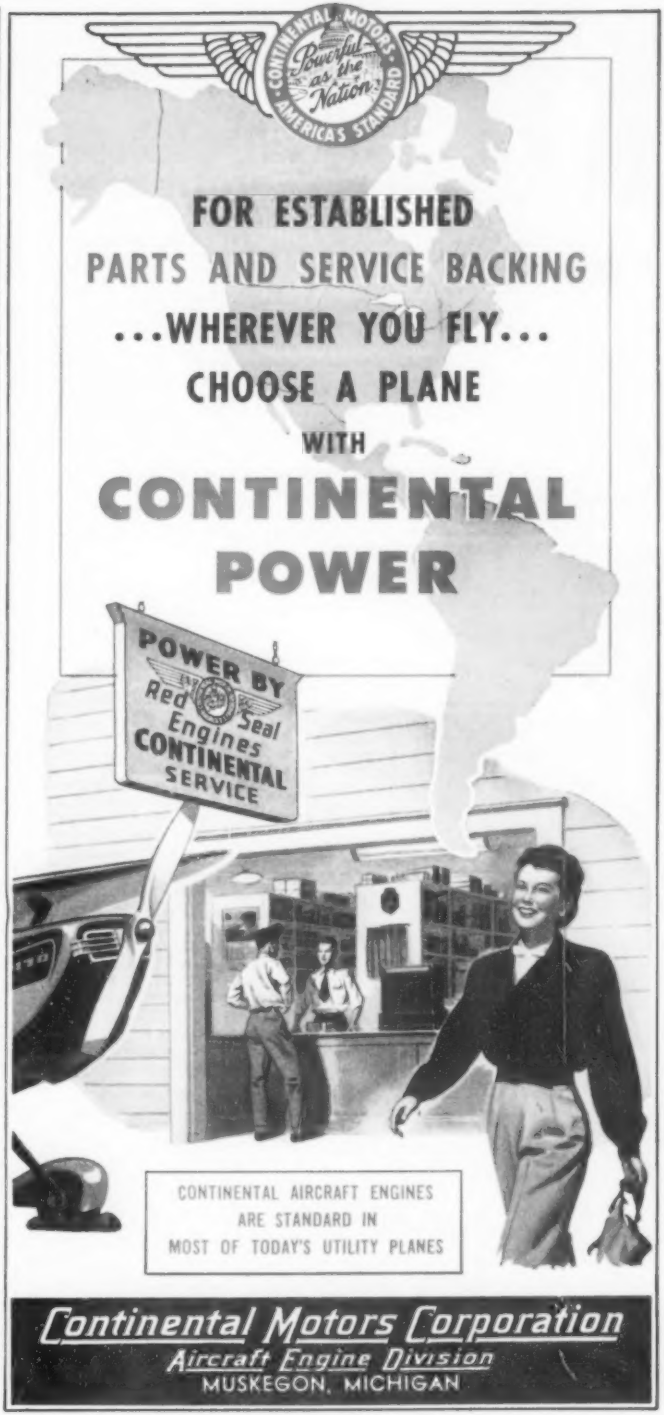
Trans-Canada Air Lines published this box score on its five 1049 Super Constellations scheduled to go into TCA service early in 1954: Galley design complete—KLM will build them for TCA; new electrical system agreed to with Lockheed; flight engineers assigned to maintenance & overhaul for selection and training; construction started on service dock at Montreal.

"Almost perfect moisture-vapor barrier" is the claim made for new plastic tape, Polyken No. 329, developed to meet Govt. Spec. JAN-P-127. High tack, adhesion and tension strength characterize product, said to be practically 100% waterproof. Bauer & Black division of Kendall Co., 222 W. Adams St., Chicago 6, Ill.

Stainless wire for aircraft carburetors, oil screens and other aviation uses is available in a wide range of shapes for myriad applications. Simples are rolled-edge stainless steel flat wire, keystone shapes and half-rounds, all bright annealed. Special shapes are supplied. Pittsburgh Rolling Mills, Inc., 524 Grant Bldg., Pittsburgh 19, Pa.

A plastic dial for ADF (automatic direction finding) indicators, said to simplify use of such equipment, is available. It's called Rabi, (rotatable azimuth bearing indicator), has compass heading markings on translucent disc with knob so that it can be superimposed on ADF indicator and rotated. Rabi, P.O. Box 522, Medford, Ore.

Metal decals are speedily installed in aircraft simply by pressing in place, instead of screwing. Adhesive backing permits decals to be bonded chemically to almost any surface, including painted ones, according to maker, Northern Engraving & Mfg. Co., La Crosse, Wis.



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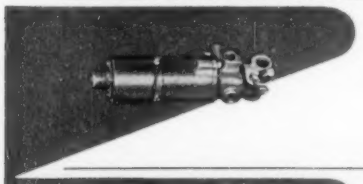
ADEL equipment is on the world's best aircraft because in Aviation there is no substitute for ADEL quality.

Typical electric motor driven fuel heater pumps designed for pumping aircraft heater fuel; also light oils, kerosene and other light liquids. Available with Radio Noise Filters.



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Pump housing includes adjustable by-pass relief valve.
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NEW AVIATION PRODUCTS

Small Oscilloscope Fits in Cockpit

A miniature oscilloscope, small enough to be squeezed into a standard 2¼-in. case so it can be mounted in the cockpit like any other instrument, has been developed by Midwestern Geophysics Laboratory.

The gage, called a Dynamic Meter, presents flight test data on an easily read dial to the research pilot flying the plane. The degree of sensitivity is such that it permits direct reading of strain-gage signals without amplification, Midwestern says. These signals may emanate from any surface of the plane being studied.

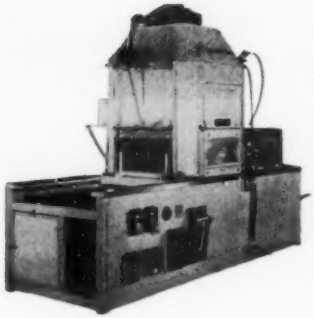
Besides its visual application, the meter lends itself to photographic observation and recording. Sensitivity is attributed to the galvanometers used in the instrument. These are described by Midwestern as "virtually insensitive to the effects of angular and lateral acceleration produced in . . . aircraft." The light intensity of the edge-lighted Lucite dial may be varied for contrast between signal spots and dial graduations. The oscilloscope weighs 2.3 lb., is powered by 24-v. d.c. current and draws 1.5 amp.

Midwestern Geophysics Laboratory, Tulsa, Okla.

Push Rod Packer

A timesaver in installing packings for push rods in the Pratt & Whitney 4360 engine has been devised by the Fram Corp., makers of gas and liquid filters.

Ordinarily push rods have to be re-



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Preforming opens a new door to the aviation industry for tote boxes, disposal cans, storage boxes and parts of similar shape and size. It's just another step in our vast operation of reinforced laminates and expanded plastics now being used to produce hundreds of different aviation parts.

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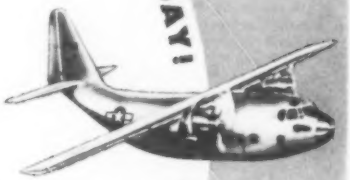

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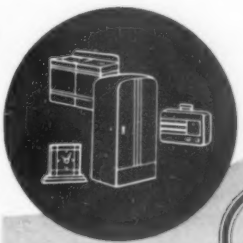

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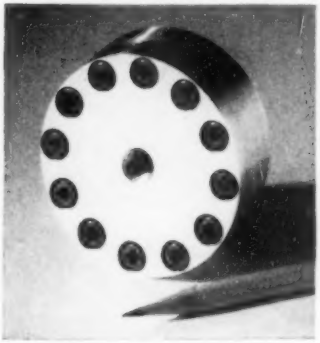
moved to take off the packings. But by keyhole cutting the packings, so they can be split and removed without disturbing the rod, a major replacement shortcut is realized. It is only necessary to back off the packing gland nut, remove the leaking seal and install a new one, the firm says. The value adjustment is not disturbed in the process.

The tool for making the keyhole slots in the packings is a pair of especially adapted cutting pliers. They were rigged up by Michael Dobrolet, a Fram employe.

Fram Corp., East Providence, R. I.



Rocket Fuel Isolator

A device which permits ordinary pressure measurement systems to be used with corrosive agents that ordinarily would damage them has been placed on the aviation equipment counter by Trans Sonics, Inc.

It is called an Isolator and can be used with rocket motors and other equipment where highly corrosive fluids are involved. The Isolator prevents liquid from entering the main gauge system. It transmits pressure with negligible drop by means of a "Kel-F" (Teflon) diaphragm and can be used with standard commercial pressure transducers, the company says.

The device incorporates fail-safe features and can be used at pressures up to 3,000 psi.

Trans Sonics, Inc., Bedford Airport, Bedford, Mass.

Propeller Seals

A special rubber seal to meet severe operating conditions encountered in certain Hydromatic propeller oil controls is being produced by National Motor Bearing Co. The seal was developed by the firm in cooperation with Hamilton Standard Propeller div. of United Aircraft Corp.

A key material used in the seals is Hycar nitrile rubber, a development of B. F. Goodrich Co.

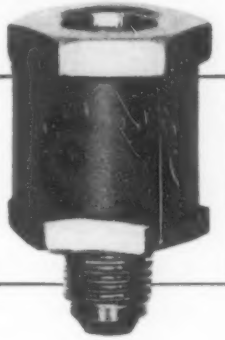
The parts are incorporated in an oil control assembly as front and rear

"Tight" makes right...

when you stop leaks—

you eliminate

operating losses!



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Operating pressure:	3000 psi
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Size: ⅜" and ¼"	
Weight: .098 lb. and .067 lb.	
Flow rates: Up to 300 CFM	

In aircraft air systems, the small volumes involved can be seriously affected by even slight leaks. Even small leaks represent a large proportionate loss of both the operating and reserve volume.

A "tight" air system is the only *right* air system . . . and, leaks caused by dirt particles are readily eliminated with Westinghouse Line Filters and Strainers. When not removed from the air system, dirt particles often lodge on valve seats—causing scoring and subsequent leakage through their highly abrasive action.

You can provide maximum protection for specified flow rates very easily and inexpensively with Westinghouse Line Filters and Strainers. Your inquiry will be most welcome.

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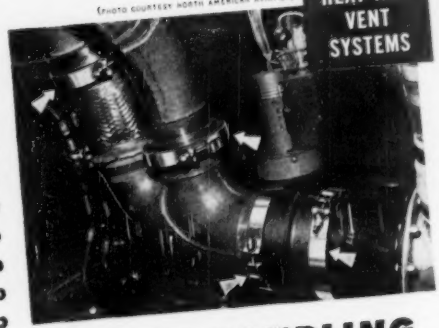
ENGINEERS NOTEBOOK

HEAT AND VENT SYSTEMS

(PHOTO COURTESY NORTH AMERICAN AVIATION)



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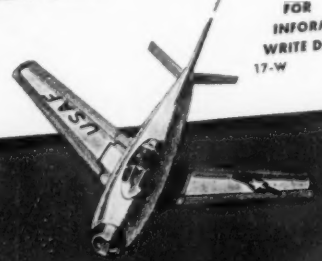
handles pressure and temperature in de-icer system

Marman V-Band Couplings with patented Quick-Coupler latches connect the shut-off valve, pressure limiting valve, and air supply line from engine compressor to anti-icing line in the F-86. In this application they are called upon to withstand pressures of 125 p.s.i. and temperatures of 600°F. This is one of thousands of applications where these standard couplings furnish a light weight, positive seal for tubing and ducting under difficult conditions of temperature, pressure, vibration and stress. The Quick-Coupler latch insures maximum speed in assembly and disassembly. Marman's ten years of specialization in the design and production of clamps, straps and couplings of all kinds assure consistent and dependable quality.

FOR INFORMATION, WRITE DEPT. 17-W



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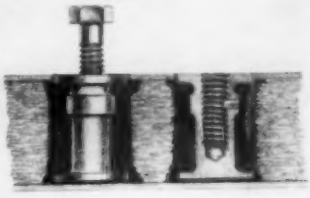
transfer bearing seals. They must withstand extremes of temperature, −65 to 220F, and strong abrasive action caused by surface speeds up to 3,250 fpm. They must be oil-resistant. Hycar rubber was selected because it met these rigid specifications and lent itself to precision molding.

Two seals are used in each installation, of 6½-in. diameter, molded onto a metal base, spring-tensioned and precision-trimmed. A specially designed sealing lip increases flex action.

National Motor Bearing Co., Inc., Redwood City, Calif.



Sandwich Fastener

A fastener insert soon to be available for sandwich-type panels used in aircraft reduces the chances of damage in securing them, Sta-Fast, Inc., claims.

The insert is molded into place to accommodate a bolt. It is self-locking, meeting requirements of AN-N-5, according to the firm.

Here is how the insert is installed: A hole is bored into the sandwich, but not all the way through. The insert is introduced into this hole, made to bear against the opposite interior wall and then bonded with Epon VI, a metal bonding compound developed by Shell Chemical Corp. When the bond sets, the insert is permanently anchored to become a strong female fastener.

Pull-out tests have shown that sandwich-type structural panels in aircraft will collapse before the fastener fails, according to the firm. Inserts are available in various lengths, thread sizes and metal types.

Sta-Fast, Inc., 2632 Ontario St., Burbank, Calif.

Speedy Metal Shears

Swiss-made shears, electrically powered to prune sheet metal in tight corners, are being marketed by Victor J. Krieg, Inc.

While the shears will take 3,000 bites per min. and cut through 16-gage metal, they are still lightweight at 3½ lb., slender enough for a one-hand grip. They cut straight lines or curves accurately by means of a guide, says Krieg. The equipment is identified as GEG-1 Lesto.

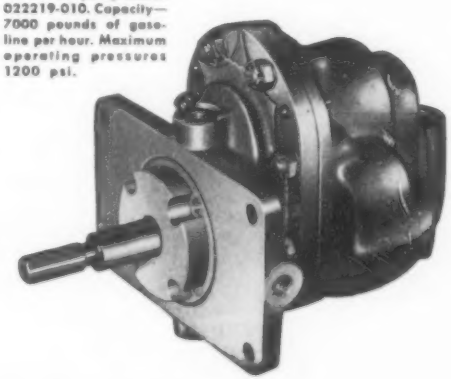
Victor J. Kreig, Inc., 51 W. 52 St., New York 19, N. Y.

RCAF VAMPIRES are fed by dependable Pesco fuel pumps

The powerful DeHaviland Goblin jet engine that powers this sleek sky raider demands plenty of fuel at all times. Pesco fuel pumps have been selected as the replacement pump for all Vampires now in operation by the Royal Canadian Air Force.

This Pesco pump costs less originally, yet gives greater reliability, longer service life, and reduced maintenance costs. That's why more and more plane manufacturers and operators are using Pesco products for controlled flow of fuel. Pesco's skilled craftsmen have provided the precision-made fuel and hydraulic pumps and controls that are standard equipment on all types and makes of planes. It is experience and know-how that can help you.

Pesco fuel pump model 022219-010. Capacity—7000 pounds of gasoline per hour. Maximum operating pressures 1200 psi.



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Nonskeds Ask CAB Staff to Show Hand

- **Irregulars, their future in balance, seek clue to stand of Operations Bureau counsel at Washington hearing.**
- **Early signs indicate official line will back scheduled carriers in claim they can handle aircoach business.**

By F. Lee Moore

The nation's lucrative nonscheduled airline industry, fighting for its life at a series of hearings in Washington and three other cities, tried at the outset last week to pin down the Civil Aeronautics Board staff on its position.

Observers for both the nonskeds and the scheduled airlines agreed that evidence presented so far by the staff indicated it was building up a case to show that presently certificated airlines can take care of all the aircoach market, which the nonskeds claim they created.

The move to pin down CAB's staff as to its position came from North American Airlines, the largest nonsked. NAA moved that the examiner require Bureau of Air Operations counsel to reveal its position during the hearings on any issue it plans to make a stand on in briefs to the examiner later. Bureau counsel asked denial of the motion. The examiner complied, but said he might make bureau counsel reveal its position after the hearing, but before deadline for filing briefs.

The staff's position may be the key to the economic fate of the nonscheduled industry, now approaching $100-million-a-year business volume. The regulatory staff can take a position in a case even though the five-member board views it only after all evidence is in.

▶ **Aircoach Applicants**—While the staff did not directly divulge its opinion, observers were led to believe present thinking is that there is no need for substantial stimulus from competitive independent aircoach lines.

There are at least 70 parties in the case, including some 60 applicants for aircoach certificates. In addition to the hearings this month in Washington, others are to be held at Miami, Los Angeles and Seattle.

American Airlines moved at the initial sessions that a final hearing be held in Washington after the others have been conducted in order that the parties involved might finalize their stands. North American Airlines seconded that motion and also asked that counsel for CAB's economic staff of the Bureau of Air Operations reveal its stand.

The examiner reserved his ruling on American's request for a return engagement in Washington after the out-of-town hearings.

Several nonsked attorneys cross-examined witnesses of Bureau counsel, trying to get them to explain the significances they drew from their exhibits. But CAB staff held fast in its position of merely presenting statistics, with no interpretation of economic bearing on the case. North American Airlines was the only nonsked to submit a formal motion that the Bureau of Air Operations reveal its position.

Washington observers generally forecast about two more months' examiner hearings, followed by perhaps a year's examiner deliberation, parties' oral argument before the Board and eventual CAB deliberation and decision.

First issue posed by examiners:

"(1) Is there a need for air transportation services by the large irregular carriers . . .?" This question was admittedly academic since the nonskeds already are doing about $75-million business a year, and previous CAB memberships have said there is a need for nonskeds' "supplemental services."

▶ **The Big Issue**—The major questions: How much supplemental service? and: How shall it be regulated?

Here are specific issues posed by the examiners:

- **What type?** "What type or types of such supplemental services would be best adapted to . . . meet the need?" Specifically, this question is to be answered in regard to routes, flight frequency and regularity, type traffic, relative price and public responsibility.
- **What economic result?** This question should not be so hard to answer, because results of several years' nonsked aircoach operation are already becoming evident.

Here are specific economic queries posed by the examiners—Would such services:

- Promote development of air transport?
- "Promote the regulation of air transportation in such a manner as to preserve the inherent advantages of such transportation?"
- Promote service at reasonable prices and without unfair or destructive competition?
- Assure sound development?
- Be "conducted economically on a continuing basis?"
- Involve "diversion of traffic, including the most profitable longhaul traffic from the certificated carriers?"

Those questions probably will get heaviest emphasis at the investigation, with the scheduled airlines pointing up the last three.

Next major question listed by the examiner asks whether the Board has the power to give certificates of public convenience and necessity to some nonskeds, stipulating certain limitations on type service. Since the Board already has done this in the airfreight case and Resort Airlines' certificate, the question may come down to how severely the Board can restrain a new certificate to "protect" lines with old certificates.

Final major question boils down to how the Board would achieve the aims determined after settlement of the previous questions; i.e., How would the Board regulate, exempt and or certificate nonsked services?

To handle this extraordinary case, CAB gave the 60-odd interested parties their choice of location for the hearings. At last record, 24 chose Washington, including four intervenor airlines; 14 Miami, including one airline intervenor; 26 Los Angeles, including three municipal intervenors, and six chose Seattle.

▶ **Major Arguments**—Tipoff on how the main argument will go can be found in the exhibits submitted by the Air Coach Transport Assn. and rebuttal exhibits by American Airlines. The nonskeds claim they pioneered low-fare aircoach business, and continue to pioneer it in the public interest.

They claim their free-enterprise competition and service of a free market gives the industry a necessary drive and progressivism that opened up both the airfreight business and the aircoach business. They assert that the old certificated airlines rested on their subsidies first, and later their lack of competition, and so have been slow to react to public demand for new services.

The certificated airlines claim the nonskeds came in with war-surplus equipment and have skimmed the cream from the profitable longhaul

routes, and that is the only reason they offer lower prices. The scheduled airlines say they have the public responsibility of serving high-cost shorthaul markets, which they must pay for by making high profit margins on the more lucrative longhaul routes.

Competition of two certificated airlines on any major route is enough to guarantee progressive service, the scheduled lines argue. They don't need a lot of specialized aircoach lines roaming free over their routes and markets to stimulate mass transportation development, they say.

▶ **American's Argument**—American Airlines in an inch-thick volume of rebuttal exhibits leads the attack in behalf of the scheduled airlines. "The competitive burden" of certificated lines, American claims already has increased greatly through route segment competition between American, TWA and United transcontinentally, Eastern and National on the East Coast, and other pairs and threes of certificated carriers elsewhere. American lists 25 major routes only two of which are non-competitive.

Now the nonskeds come along, American argues, and "skim the cream" from the paying longhaul routes. The certified lines develop the shorthaul traffic too, and are reducing subsidy needs at the same time, American points out.

American says the Big Four certificated lines have lower costs than the 11 smaller ones. AA exhibits a chart showing that costs decrease in proportion to size of operation, apparently to refute nonsked claims to greater "efficiency" through their smaller size and greater flexibility of management.

• **Nonsked advertising.** American exhibits also feature several pages of "sample 'irregular' carrier ads" in which nonskeds hold forth scheduled services to the public.

• **Cream skimming.** AA reports that 75% of nonsked passenger traffic is between five pairs of cities and almost nine-tenths between 10 pairs of cities.

▶ **Nonsked Case**—The nonskeds' lusty Air Coach Transport Assn. sailed into the hearing with a fighting brief championing the "independents" as the necessary free-enterprise ingredient for industry growth through creative competition. ACTA scoffs at CAB's repeated pleas and threats aimed at driving the certificated airlines into the aircoach business.

The association notes that the Board in ruling against applications in the transcontinental coach-type service case a year ago announced it would instead "expect, and require, certificated carriers to expand and develop aircoach services."

"That command was a frank admission that it believed that governmental decree can be substituted for competitive drive, and that belief is reminiscent of the reasoning of the 'planner,' who has no confidence in the competitive system and who believes that economic progress can be effected by government fiat rather than by individual initiative."

"The Board's reluctance to increase materially the number of certificated carriers has apparently been motivated," ACTA says, "by its belief that it is a sort of public service commission and that the airlines are public utilities of the inherent-monopoly type."

The association hits the past high-fare philosophy under that concept, pointing out that nonsked coach service has shown that air transport demand is "high elastic" and that airline income can be augmented by lower tariffs. "The Board, therefore, should be grateful to the independent airlines for having reduced the national average cost for air transportation and for having expanded it through coach and freight service."

▶ **Ignore Coach Market**—ACTA notes that the first issue CAB has presented for decision in this investigation is whether there is any need for air transportation services by the large irregular carriers. The scheduled airlines gave only deluxe service until late 1949, ACTA points out. They started coach "only after the independent newcomers . . . had demonstrated as early as 1948 the public interest in low-cost coach service."

Truman Backs Airport Findings

But there are many hurdles facing 'immediate' action on recommendations of the Doolittle Commission.

President Truman has asked Civil Aeronautics Board and the Commerce, Defense and Post Office Departments to "begin immediately to place into effect the recommendations of the President's Airport Commission." The recommendations were prepared at the President's request by a committee headed by Gen. James Doolittle after a series of major air disasters around Newark Airport had aroused alarm among residents living near airports.

In separate letters to the department heads, the President asked them to study the Doolittle recommendations. "If such study reveals that implementation is necessary or desirable," he wrote, "you should initiate appropriate action to put the recommendations into effect, giving due consideration to budgetary requirements, to increase safety of flight and to increase safety of people and property in the vicinity of airports."

▶ **Controversies**—The White House statement urging immediate action was interpreted by Washington observers as an election-year stimulus to the agencies to get going, while the "Study" tone of the President's letter was interpreted as official recognition of the controversial nature of some recommendations.

Recommendations assigned Commerce Secretary Charles Sawyer will go to Civil Aeronautics Administration for handling.

Major tasks assigned to the agencies were delegated by the President following advice of the Air Coordinating Committee.

Four most controversial items currently:

• **Training over crowded areas.** Defense is urged to avoid this, but there is a question of how far Air Force and Navy can or will go toward moving out of town.

• **Military-civil airport use.** Defense and CAA are urged to avoid "joint use" of airports as much as possible. But the military trend is the other way.

• **Helicopter development.** CAA and Post Office are urged to foster copter development, particularly copter instrument navigation equipment. The U. S. avionics industry may find the British Decca system coming into American cities for this purpose. An Air Transport Assn. operations expert notes that Decca appears to be the most accurate and simple system for close-in copter navigation around cities in bad weather. Decca is reported installing a system in New York to demonstrate its efficiency for harbor navigation.

• **General aviation.** The Utility Airplane Council of the Aircraft Industries Assn. says importance of private plane operation was slighted in the Doolittle report. Specifically, the council feels that the wording of the report indicates the military might crowd out "non-essential" airport operations, "far too often" interpreted as meaning private flying. Also, the council believes scant attention was given small airports and private planes' rights in traffic control at big airports. The council said federal certification of municipal airports will not make them safer or more useful.

Other important presidential assignments from the Doolittle report:

• **Airport construction.** CAA to get airport runway extension areas cleared to at least 1,000 ft. beyond the runway end; to see that airport runway construction is in the direction of the modern parallel-runway layout—single direction for minimum cost, with a per-

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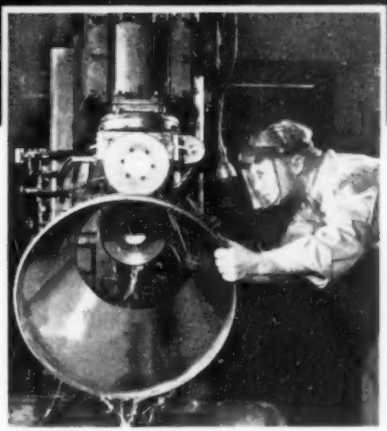

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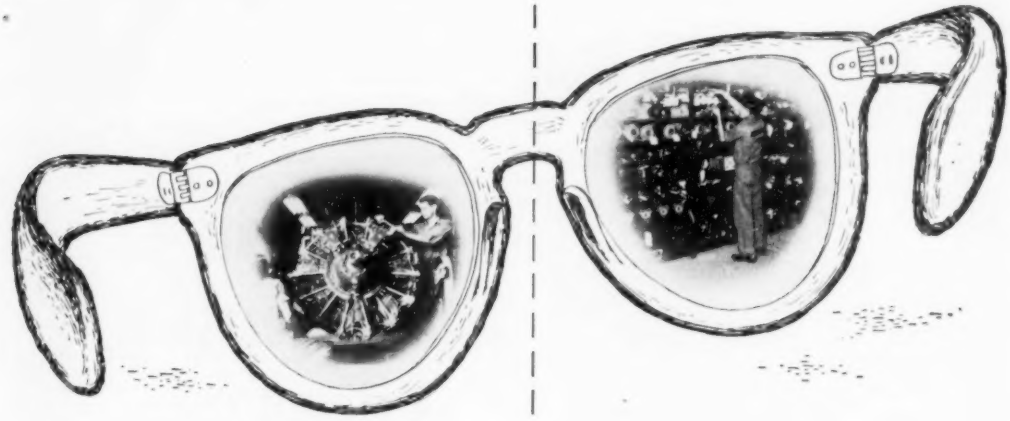

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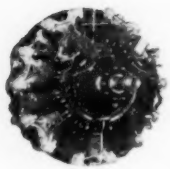

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pendicular cross-runway where needed.

• **Federal control of airports.** CAA and CAB to look into the possibility of requiring federal licensing or certification of local airports. This may require an act of Congress, but the two agencies have the job of deciding.

• **Maneuvering weather minimums.** CAA to raise weather minimums for visual circling and maneuvering of planes under the overcast.

• **Cross-wind landing gear.** CAA and Defense to expedite development and use of cross-wind landing equipment and procedures.

• **Ground noise.** CAA and Defense to do more to cut down noise of ground run-ups and other operations at airports. Construction of deflector fences and tighter control of time and place of noisy operations may be included as well.

• **Flight simulators.** CAA, CAB and Defense to boost use of flight simulators and other means to train pilots in emergency action close to the ground, where actual flight training is difficult. ATA has a committee to look into airline cooperation in buying flight simulators.

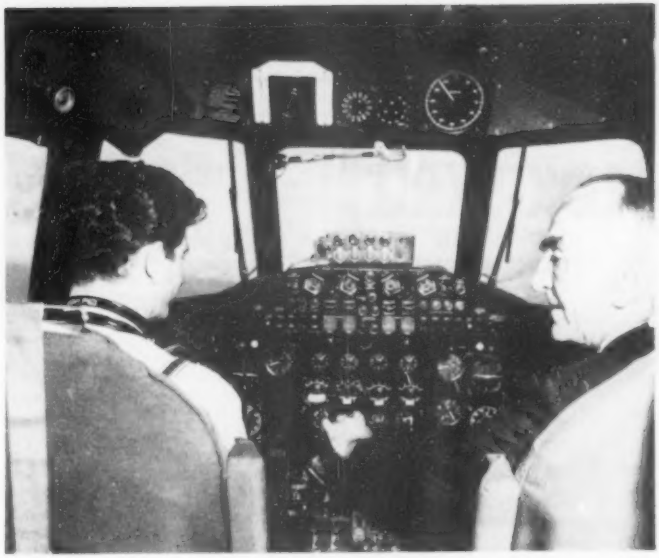
Some of the airlines are studying flight simulators, but only United is known to have placed a large-scale order for them so far. This problem is complicated by deterioration of the World War II-built Link navigation trainer, now being replaced by military "general-purpose trainers" which may not be able to meet the requirements of the airlines.

• **Cockpit simplification.** CAA and CAB are instructed to work on simplification and standardization of cockpits. However, Air Force testified at the recent Airworthiness Review that cost of changing existing cockpits is prohibitive. So standardization and simplification apparently is years off, and airlines and manufacturers are opposed to a regulation which would force a single standard.

• **Federal aid to airports.** Commerce is charged with the job of getting larger airport aid appropriations out of Congress, which cut the fiscal 1953 request from $26 to $20 million.

• **Pilot age problem.** The President also asked CAA to look into other recommendations scattered through the text of the Doolittle report, including "the problem of the ageing pilot." Cooperation with the Aero Medical Assn. was suggested.

The report also suggested that old-timer pilots ride along on long-range flights as advisors, but pilots and airlines oppose this split command idea as impractical and even dangerous. In practical operation today, the captain already monitors the copilot's flying in many approaches and other complicated operations, and hence needs no monitor.



RICKENBACKER IN VISCOUNT: British jet transport production needs more thrust.

Jet Liner Enigma: Delivery Dates

By Nat McKitterick
(By Cable to Aviation Week*)*

London—Persistent reports that U. S. transport operators, impatient with the slow pace of American jet airliner development, are ready to buy de Havilland Comets, seemed nearer to actuality these past few weeks than at any previous time.

But industry observers still are convinced the carriers are using DH as a bogey to accelerate efforts of American transport manufacturers.

▶ **Developments**—The situation began boiling with recent visits here by U. S. operators, accompanied by their right-hand men, to look the British planes over firsthand at the factories and also watch them perform at Britain's big yearly aviation spectacle at Farnborough.

There were also these provocative developments:

• **Eastern Air Lines'** President Eddie V. Rickenbacker's reputed statement upon touching down at London Airport that "I'm here to buy 35 to 50 of your Comets, but I must have them quickly —within the next two or three years."

(But back in the U. S. after a ten-day tour of British jet transport plants, Rickenbacker clearly was disappointed in de Havilland's inability to come anywhere near his delivery schedules. "We are spending more than $100 million on our new fleet of Super Connies and Martin 4-0-4s," he said, "and with these planes scheduled to be amortized in four years, I will be ready to spend another $100 million on a fleet of jets. We can't think anymore in terms of a year or two in re-equipping. . . . We must think four or five years ahead.")

• **Pan American World Airways'** President Juan Trippe's reported remarks to U. S. officials aboard that he intends to buy "Comet-type" transports for trans-Atlantic service.

• **BOAC** Chairman Sir Miles Thomas' statement at a pre-Farnborough air meet that "a North American civil airline operator is on the verge of signing on the dotted line for a fleet of British jetliners."

BOAC's Sir Miles let it be known that he was referring to PAA. Pan Am spokesmen and sources close to de Havilland promptly denied that such is the case.

All this smoke, however, underlined the tremendous interest U. S. operators have been showing in what Rickenbacker reportedly called Britain's "worldbeater."

It is certainly no secret that Pan American engineers and other personnel have been shuttling back and forth between de Havilland, BOAC and the U. S. for many months gathering precise data on Comet operations for the airline.

▶ **Problems**—But even if the principals had intentions of taking the big leap, observers point out that there still are numerous hurdles to be overcome be-

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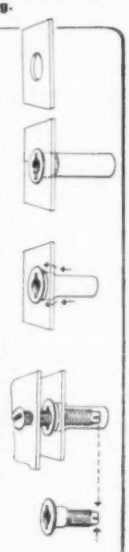
Crimped internal threads of Lok-Skru provide secure locking device for attachment screw.



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fore any actual Comet contracts could be signed.

For one thing, big compromises will have to be made on both sides to get DH delivery dates and U. S. requirements into line.

Rickenbacker said he wants his Comets by 1955 and Trippe reputedly has been talking the same kind of schedule. The British builder now has firm and actual orders for approximately 49 Comets, and although materials are not tight, labor and tools are. Present plans for the jet transport's output are to turn out four monthly by 1955 at DH's Hatfield plant and by the prime contractor, Short Bros., which is only now tooling up for the Comet.

Rickenbacker also suggested that DH put two or three shifts on the Comet, or try to import skilled, large-scale production experts from the U. S.

►**U. S. License**—Licensing of Comet production to a U. S. manufacturer—Lockheed has been suggested—is strongly opposed by the British, who are determined to build a stable aircraft industry.

A deciding factor in stepping up the transport's production to attract the juicy U. S. market could be entrance of Churchill into the picture. The government was told last July to rework its whole rearmament program to give exports a better break.

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Still another difficult hurdle to be overcome by the negotiators is what model Comet the builder can furnish at the earliest date.

Trippe and Rickenbacker showed most interest in the Series 3—a stretched-out Series 2 carrying 60-75 passengers, with 3,000-mi. range and more powerful versions of the Series 2's Rolls-Royce Avons.

The Comet 3 is designed to cruise at 510 mph. with its 9,000-lb.-thrust class engines. In the quantity desired by Rickenbacker—35 planes—this series would cost approximately $2 million each.

►**U. S. Hopefuls**—The big drawback, again, is time. Prototype Series 3 is only now being built, but if quantity orders were placed now, it is believed de Havilland could start Series 3 deliveries in 1957. Both Trippe and Rickenbacker consider the Series 2 an uneconomic proposition for their purposes; BOAC, which has 17 Series 2s on order reputedly is considering it for experimental trans-Atlantic mail service.

U. S. operators believe Douglas' hopes to get its big "DC-8" jet airliner (AVIATION WEEK Aug. 11, p. 13) in the air by 1958 are on the optimistic side—they say that 1959 or 1960 would be closer to fact. Lockheed may be in the same situation. Boeing's proposed jet, based on the B-47 and B-52, (AVIATION WEEK Sept. 8, p. 7) now looks like best bet for "America's first."

Meantime, U. S. interest in the DH Comet will be kept to a high pitch by BOAC's experiences with the planes on actual scheduled services to Africa and the Far East, operation of the Canadian Pacific Comet 1A and the order by Linea Aeropostal Venezolana for Series 2s to be used on the Caracas-N. Y. run.

CAA, CAB at Odds In Robin Revocation

Despite the fact Robin Airlines, charged with unsafe nonsked operations, offered to surrender its operating certificate to Civil Aeronautics Administration, CAA has irritated Civil Aeronautics Board members by pushing revocation proceedings through a hearing and oral argument involving 900 pages of testimony and thousands of dollars of travel expense.

Testimony before the Board this month indicated that CAA is forcing adjudication of this safety matter so it may feel justified in denying Robin a new operation certificate at a later date.

But the Board contends in this case, as in the similar Regina case recently, that CAA alone can decide each safety matter on present merits. Board revocation of Robin's operating certificate now would have no bearing on the airline's fitness for a new certificate 90

days from now, CAB members contend. "They can't pass the buck to CAB on a carrier's operating safety qualification—that's an administrative decision," a Board official told AVIATION WEEK.

The Board twice has publicized its opinion that CAA was lax in granting Robin a new operating certificate last year—just before the carrier had two major crashes, the second fatal to 29 (AVIATION WEEK Sept. 1, p. 13). Some observers believe that is why CAA is trying to pass some responsibility to CAB on future decisions of this sort.

▶**Admit Complaint**—Before the examiner's hearing, Robin offered to surrender its certificate rather than go through the revocation proceeding, but CAA refused to accept the surrender. The examiner admitted amended complaints from the Administration the day of the hearing and recently came out with a finding that Robin definitely should have its operating certificate revoked.

Rather than accept the revocation, Robin carried the case to Board oral argument, charging that the examiner should not have accepted the late filing of CAA-amended complaints. Some qualified observers at CAB believe Robin hopes to stop the proceeding on grounds of short-cutting due process of law, and that the airline might then be permitted by CAA to surrender its operating certificate rather than be forced through still more expensive proceedings for the same reason.

Ocean Tourists

- **Atlantic traffic up 50%, with 10% more flights.**
- **But the big question is: How sound is aircoach?**

Trans-Atlantic airlines are keeping their fingers crossed on tourist service—can it really be as sound as it looks?

In May, June and July, the first three months in which ocean coach service was offered, North Atlantic airlines hauled 50% more passengers than in the same period a year ago. Coach accounted for most of the increase. Yet first-class traffic apparently was unharmed by coach.

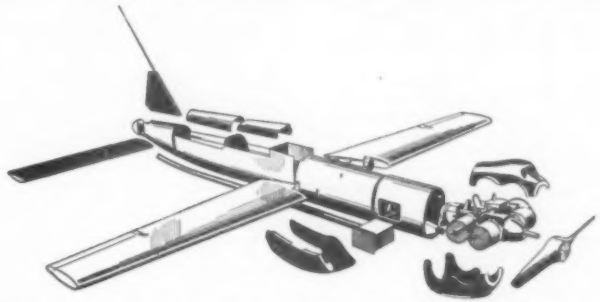
Disclosing those figures in his annual report prepared for delivery at the annual meeting in Geneva of the International Air Transport Assn., Director-General Sir William Hildred pointed out that "These phenomenal results were achieved in spite of drastic curtailment of services in May" due to the fuel shortage stemming from the strike of refinery workers.

▶**High Load Factors**—The curtailment

(Advertisement)

Fastener Problem of the Month

Ready replacement of target plane sections **September 1952**



PROBLEM: Fastening devices on pilotless target planes must withstand extreme loads and severe vibration. In addition, planes are frequently taken apart and examined for structural failures and landing damage after flight. Every "hit" means that an affected part must be repaired or replaced. As illustrated, The Radioplane Company, Van Nuys, Calif., met these problems with a clean design that reduced this radio-controlled target plane to a minimum number of easily mated sub-assemblies. To join these sections they looked for a fastening method that would withstand the required stresses—and still be simply removed and reinstalled for economical operating costs and maintenance.

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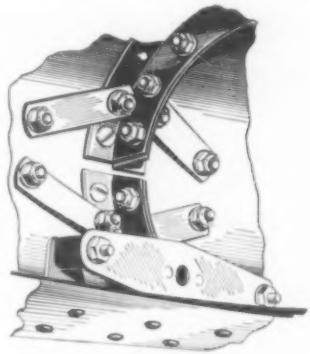

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of services makes the coach record even more startling. While 50% more people were being carried across the Atlantic by air, the airlines increased the number of flights by only 10%. That has produced very high load factors and is in great measure responsible for the fact that first-class service has not suffered heavily by the booming coach business.

What has happened is that the demand for coach seats created—as expected—an equipment shortage. Two carriers, El Al and Trans-Canada Air Lines, operate only coach service, no first-class flights. Other carriers have turned first-class planes over to coach operation.

As a result, there were fewer first-class passengers carried in the three months this year than in the same period last year. But because there were fewer planes to haul them, the first-class load factor has shot up by 20%. From an economic viewpoint, this may be a greater advantage to the airlines than if the number of first-class passengers had risen slightly.

► **Passenger Traffic**—In his report, Hildred comments that tourist service is possible by "the more economical utilization of aircraft capacity for the purpose of carrying revenue load." And the same thing happened with first-class service.

In the months of May, June and July of this year, 150,000 persons crossed the Atlantic by air, Hildred told the IATA meeting, as against 100,000 in the same three months of 1951.

But those three months bridge the peak travel time. The real test of the success of the tourist service comes later and that is what the airlines are waiting to see.

Hildred outlined the problem. He said tourist service must be economically self-supporting, must bear a full share of general airline overheads and must not add to the overall costs of operation by reducing loads on first-class operations.

"Tourist service will be successful if it is assured of consistently high average load factors," he warned. And he expects that it will still be difficult to insure high load factors year-round.

SHORTLINES

► **American Airlines** has won its action against European-American Airlines for name similarity; trans-Atlantic air-freight applicant has agreed to change its name to European-American Airways if it starts operations.

► **Air Transport Assn.** says domestic certificated airlines had "the lowest fa-

tality rate in airline history for the 12-month period from September, 1951, through August, 1952." Fatality rate was 0.39 per 100 million passenger miles.

▶ **American Road Builders' Assn.** study of site selection for new airports estimates direct 30-yr. public saving for every mile nearer town an airport is located would be $13,440,000 for an airport serving 11,520 people a day, $6,720,000 for 5,760, $3,360,000 for 3,200 people a day, etc.

▶ **Chicago & Southern Air Lines** has asked CAB for a route extension from Memphis to New York, similar to Delta's standing application for such a route in its Northeast Airlines merger proposal. C&S also asks a route to close the circuit from N.Y. to Chicago and Detroit. Delta-C&S merger is up for Board approval.

▶ **Civil Aeronautics Board** has issued a new economic regulation to force air carriers (mainly nonsked passenger lines) to use only their CAB-approved corporate names or reasonable abbreviations in advertising and other public dealings. Carriers must comply by Nov. 15. An airline wanting another name must ask CAB.

▶ **Colonial Airlines'** former President Sigmund Janas, Sr. says he has sold 40,900 shares of his Colonial stock to end his involvement in the pending Eastern merger case. A company spokesman says Janas has paid the $75,000 CAB ordered him to pay the company last year for having previously spent company money on entertainment.

▶ **Commerce Department** will announce soon a proposed program for charging airlines for use of civil airways.

▶ **Eastern Air Lines** in its first five months operation of Super Constellations attained 10 hr. utilization a day on the new 14-plane fleet. Average domestic airline utilization of four-engine planes is 7 to 9 hr.; EAL operates above this mark. Super Connies delivered by Lockheed so far have averaged 658 lb. under contract weight, and the manufacturer estimates this represents $90,000 a year in additional revenue potential, at present load factors.

▶ **International Civil Aviation Organization** last week started a special conference in Rome to revise regulations on liability of airlines for damage suits.

▶ **Slick Airways** is reported offering one of its two present DC-6As for sale after receipt of one or more of its additional three on order. Slick recently sold its prototype production model DC-6A.

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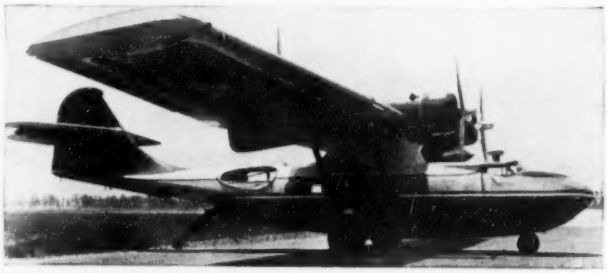

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550	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
300	1-H260-K & KA	Pesco	Hydraulic Pump
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The Affairs of ALPA

The affairs of the Air Line Pilots Assn. are beginning to have a notorious ring about them. Reports of "rival" groups, conflicting court decisions, claims and counter-claims, all go to make a most confusing situation.

►**How It Began**—The turmoil began over a year ago when ALPA's board of directors appointed a committee on reorganization. The findings and recommendations of this group started the ball rolling for the ousting of David L. Behncke, although that was not one of its objectives. Popular demand plus the fact that Mr. Behncke could not stand "meddling," even from members who form the organization, were the basic reasons for trying to remove him from the presidency.

This precipitated a year of court proceedings, a decision for Behncke, a stay order from a higher court and a promise of more legalities to come.

Many people, including myself, are confused by this legal hocus-pocus. The ordinary person is inclined to believe that when a group votes 100% on something, that's that. But this line of reasoning ignores two facts. One is that everybody is entitled to his day in court; the other is that the legal profession usually turns this "day" into something more akin to a year.

Most pilots are unable to follow events in Chicago in person, so they differ in their interpretation of the proceedings and also in the methods they feel should be used to reach the objective. And it should be stated here and now that the pilots, to a man, have the same objective: formation of a strong, alert and democratic organization.

►**Possibilities**—There are various actions possible along the way to attaining this. One is a decisive court ruling—although this could be years in the offing. It could also be action taken at ALPA's convention this October—but this, too, will probably be subject to court action.

The step which has caused most comment is the formation of a new organization, ATPA—Air Transport Pilots Assn.

Most unlikely of all possibilities is that Behncke will accede to the wishes of the majority and go away.

Barring the remote possibility of a speedy and binding court ruling, the key to the problem is Behncke. In fact, the PROBLEM is Behncke. In his sermons to the members, he continually refers to the "illegal group" as though there were a small band of conspirators at large. For his purposes, this is a good line. But the fact is that the "illegal group" comprises 90-odd-% of the membership.

One sure way to be free of Mr. Behncke is via a new organization. This is where ATPA comes in. Many people feel that ALPA will be tied up in court for years to come—a ruinous proposition. ATPA, however, would be free from these entanglements, free to choose its own officers and organize according to the pilots' desires. This action is, of course, last resort. No one wants to go off and leave Mr. Behncke and a half-million-dollar treasury, nor do the pilots wish for the task of reorganizing.

But the possibility is there.

►**No Split In Ranks**—In the year under Clarence Saven, ALPA has prospered. Finances have been efficiently handled and reserves built up; pilot representation in professional circles increased; labor contracts signed with greater dispatch, and there are signs of better labor-management relations in the airline world.

Regardless, then, of outward appearances there is no "split" in pilot ranks. They are as closely knit as always and will, despite interruptions, emerge with an organization to their liking and far stronger than in the "olden days."

WHAT'S NEW

New Literature

Performance gains for internal combustion engines equivalent to an increase of 25 in the octane rating of the fuel have been claimed from the use of a **synthetic catalyst** developed by Dr. Sophia Berkman. This catalyst is cast into the head of the cylinder; it is compounded from minerals which occur in nature and costs relatively little. When this was first announced (AVIATION WEEK Jan. 21, 1952, p. 67) there were mixed reactions from the field, some of the skepticism possibly being the result of incomplete knowledge.

Now a complete monograph, authored by Dr. Berkman and describing combustion, knocking and the effect of catalysts, has been made available through the Associated Development & Research Corp. The pamphlet is highly detailed and technical and would make formidable reading for anyone not deeply concerned with combustion problems.

A limited number of these monographs are available to technicians with a legitimate interest in the subject. Requests should be made on company letterhead to Associated Development & Research Corp., 150 Broadway, New York 7, N. Y. —DAA

Telling the Market

Wings for Industry is 13-min. sound movie in color, starring Jimmy Stewart, showing operations of Slick Airways. Film is available to service clubs, trade groups and schools from Gerow F. Miles, Eastern division manager, Slick Airways, New York. . . . Story of engineering, production, technical assistance and service setup of Industrial Truck division of Clark Equipment Co., is carried in latest edition of firm's magazine **Material Handling News.** Write company at Battle Creek, Mich.

Kwik-Klamps, for work-holding and fixturing operations, are described in 12-page catalog by Danly Machine Specialties, Inc., 2100 So. Laramie Ave., Chicago 50. . . . **Bulletin 718, Stampings in Small Lots,** details fast tooling process permitting inexpensive output in quantities of 25-25,000 pieces. Write HPL Mfg. Co., 15129 Miles Ave., Cleveland 28, Ohio.

Bulletin SG-52 lists prices of **Standard thread gages** made by Detroit Tap & Tool Co., 415 Boulevard Bldg., Detroit 2. . . . Four **one-stop, short-run stamping services** are described in Bulletin 161 available from Federal Tool Mfg. Co., 3600 Alabama Ave., St. Louis Park, Minneapolis 16.

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EDITORIAL

More Dangerous Exhibitionism

An Air Force fighter disintegrates at 200-ft. altitude while "thrilling the crowds" at the International Aviation Exposition at Detroit on Labor Day weekend. The two crewmen die and five spectators are injured by falling debris. Hundreds of others are endangered.

Less than a week later at Farnborough, England, a supersonic fighter disintegrates, kills not only its two crewmen, but 27 spectators, injures others, endangers hundreds more.

So it goes. So it will continue to go until one of these days aviation will be jolted fully awake by an outraged press and public demanding that we outlaw this dangerous exhibitionism. Why can't we in aviation learn our lessons before the public indignation gets to Elizabethpitch, and demands extreme measures like the Newark closing?

Aviation will never grow up until it controls its "showmanship."

How can anyone with the best interests of aviation at

FLYING WRECKAGE INJURED 5 SPECTATORS AT DETROIT.

heart tolerate conditions that encourage accidents or greater loss of life than is bound to occur in the course of necessary commercial and military operations?

Every other segment of aviation fights to avoid accidents. Why give shows a waiver?

Safe and sane air shows draw as many crowds as stunters. Let's sell the public on safe flying, not kill them with careless flying.

Air shows that invite disaster by high speed or other unnecessary strains on materiel and pilots are liabilities to aviation. They are not conducted under laboratory conditions that bring out useful data. They are staged for exhibitionism, publicity, or "thrills." The danger threat is always there. Ask the insurance companies what air race sponsors want in loss coverage!

How much longer will aviation tolerate these deliberate invitations to death? More important—how long will the public tolerate them? —Robert H. Wood

CAPITOL STUFF

By JOHN O'DONNELL

Washington, D. C., Sept. 3.—We can imagine old Pal Joey in the Kremlin getting a big kick these days out of how we Americans like to play Russian roulette. Remember that old game? A revolver with one live cartridge. Give the barrel a spin, shoot at your head. If you hit an empty you win. If the trigger hits the cartridge, you don't worry any more because you haven't enough brains left to function.

This Republic of ours played its last game of Russian roulette last Saturday at what was known as the International Aviation Exposition at Detroit. We're not going to have any more of these shows. For this, may the lords be praised. We are beginning to grow up. We hope.

What could have happened in Detroit was this:

The merest shift of a gust of wind would have brought a major catastrophe to the nation's defense.

When the jet fighter F-89 Scorpion, piloted by Korean ace Maj. Donald Adams, tore itself apart immediately over the heads of America's air-power brains, these individuals were clustered in a group and were only saved by a miracle or chance. They won't be in such a position again, but here they were last Saturday:

Air Force Secretary Thomas K. Finletter.

Air Force Chief of Staff Gen. Hoyt S. Vandenberg.

Gen. Curtis B. LeMay.

Gen. Nathan F. Twining.

Lt. Gen. Laurence S. Kuter.

Maj. Gen. William H. Tunner.

White House Air Aide, Maj. Gen. Robert B. Landry.

Secretary Finletter
It won't happen again.

It would be bad enough for the nation to lose this top brass in one flaming moment — and there was only a split second between them and death. On top of this, the air brass had with them their top staff officers who would move up to post of command when their senior officers were killed.

As of equally great importance—we hesitate to say even greater—there were gathered in the same spot the outstanding engineers, designers and production experts of America's aviation industry—such geniuses as Larry Bell of Bell Aircraft, Malcolm Ferguson of Bendix, William Lear whose outfit turns out automatic pilots and electronic equipment for fighting equipment and a whole hatful of names of men who know the answers to the problem of how we can keep America more powerful in the air than can the engineers working for Moscow.

And the point is, that every man-jack of the air group is now alive simply because a split-second twist of a gust of wind saved their lives. It won't happen again.

Here is what we got from the serious top boys in the Air Force at the Pentagon and the top aircraft producers of the nation. It boils down to this:

The days of the barnstorming air circus have gone. When we're fighting for air power for our lives we don't want any clowns of the skies. That went out years ago. What's going out now and must be ended are air shows which draw thrill-seeking spectators who pay admission fees to some operators who sell tickets on the all too-human appeal that somebody may be killed in these speed demonstrations and you shouldn't miss the chance to be present at the possible tragedy. That was all right in the old days. But the life of the nation which depends on air-power is too important to be mixed up in a ticket-selling racket to draw a crowd."

And the conclusive observation:

"There is no place for a jet plane in a flying circus. The equipment and the man cost too much to risk both in a show to thrill cash customers."

Press indignation over "barnstorming air circuses" will increase; this appeared in the New York Daily News, circulation over 2,160,000.

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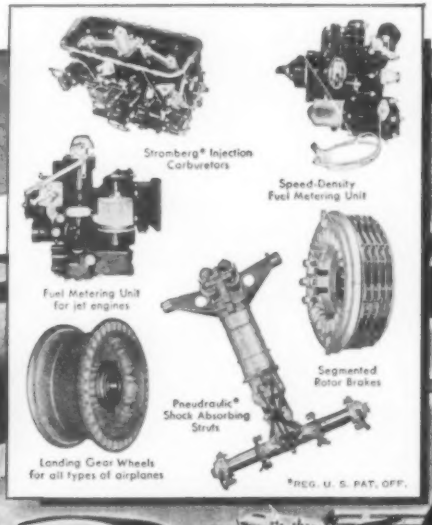
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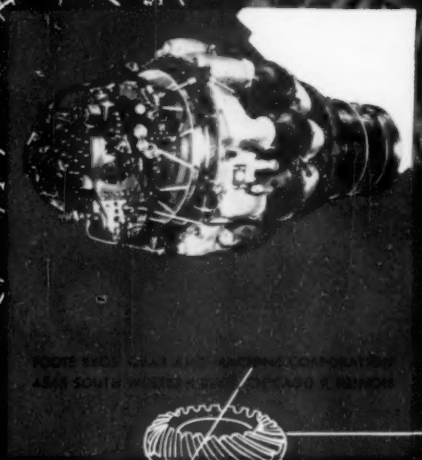

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